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THE JOURNAL

OF

THE ALLIED SOCIETIES

VOLUME VII—1912

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SOCIETY
THE BOSTON AND TUFTS DENTAL
ALUMNI ASSOCIATION
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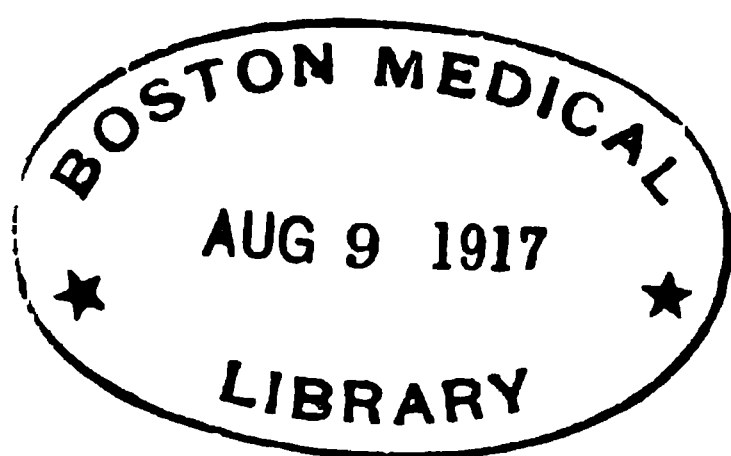
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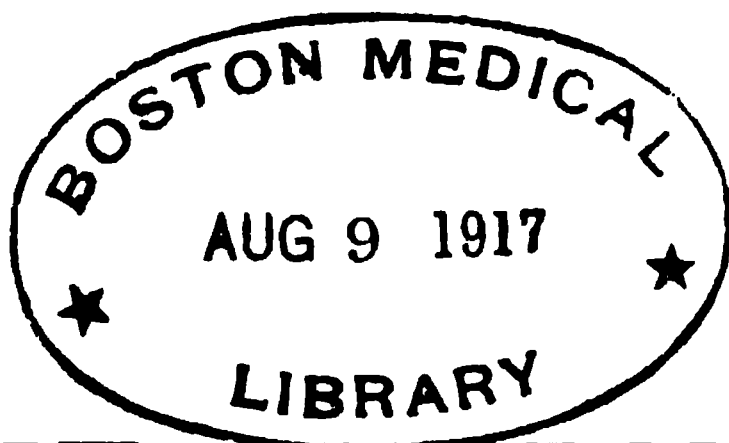
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Harold Williams



THE JOURNAL

OF

THE ALLIED SOCIETIES

VOL. VII.

MARCH, 1912

No. 1

EDITORIAL CONFERENCE

At the Hotel Lenox in Boston on the afternoon and evening of Friday, February 2, there was held a very pleasant conference of all the executive committees of the Allied Societies engaged in publishing THE JOURNAL. At 4 p.m. the meeting was called to order by Dr. Samuel T. Elliott. Drs. E. H. Smith of Boston and C. Edson Abbott of Franklin were elected chairman and secretary respectively. Dr. Smith gave a short explanation of the purposes and status of THE JOURNAL. Dr. Dunning amplified this and stated a proposed organization which would make THE JOURNAL more business-like and more effective in its purpose of advancing professional journalism. Dr. Davenport made suggestions in regard to proposed changes. Drs. Wheeler, Potter, Taylor, Davenport, Sr., Lindstrom and Boardman spoke. It was moved and carried that the Metropolitan District shall not be taxed except for charges for text actually used in publication of its proceedings, as its parent Society, the Massachusetts Dental Society, is already a member of the Alliance. The election of officers resulted as follows:

Dr. Wm. B. Dunning, Editor in Chief.

Dr. S. E. Davenport, Jr., Associate Editor.

Dr. Karl C. Smith, Treasurer.

BOARD OF PUBLICATION.

Dr. C. Edson Abbott, Chairman.

Dr. S. E. Davenport, Sr.

Dr. Samuel T. Elliott.

Dr. Charles T. Warner.

Dr. Charles A. Jameson.

Dr. Alfred G. Richburg.

It was moved by Dr. Hopkins and carried, that it be the sense of the meeting that the Editor should receive a salary as early as possible. There were further remarks by Dr. C. Edson Abbott, secretary, who stated that many of his previous suggestions had been adopted and that the societies had full confidence in the newly elected editors and gave their hearty thanks to the men who had thus far carried on THE JOURNAL. It was doing well; now grit and perseverance were the things needed.

In the evening there was a very pleasant banquet and later a general discussion of plans and prospects of the new JOURNAL, with the following program:

TOASTMASTER.

Wm. H. Potter, D.M.D.,

TOASTS.

Welcome, Dr. W. H. Potter.

Response, Dr. S. E. Davenport.

Our Guests, Dr. Piper.

THE JOURNAL, Dr. Wm. B. Dunning.

To Dr. Alfred G. Richburg was given the hearty thanks of all present for his well planned arrangements for this occasion.

It was the sense of all that this most harmonious gathering boded well for the increased usefulness of THE JOURNAL in its particular field. An aggressive advertising policy and better arrangements for the publishing of text will make the members of the societies who are supporting this exponent of dental journalism by the dental profession, for the dental profession, proud of the part they have taken in sustaining this work.

C. EDSON ABBOTT, *Secretary.*

DENTAL DISEASE AS IT AFFECTS THE MIND*

BY HENRY S. UPSON, M.D.

Professor of Neurology in the Medical Department of the Western Reserve University, Cleveland, Ohio.

In honoring me with an invitation to address you this evening, your secretary spoke of two questions as interesting the Society especially at the present time:

What reflex effect upon the brain results from a lesion of the Fifth Pair of Cranial Nerves?

Will impaction of erupting teeth produce pathological manifestations in the brain?

In this broad field the effects of dental irritation on the mind have seemed to me to furnish the most available subject. During the past five years a skiagraphic study of the dental conditions of 350 to 400 patients suffering from mental aberration or defect, has convinced me that dental disease among defectives and the insane is, in many cases, in causal rather than in casual relation with the mental condition. Of this it is not the purpose of this brief paper to furnish a body of proof, but to outline the method which should guide an investigation into this relationship, with a few examples of its application.

It has long been known that insanity may be due to physical disease of various organs of the body, the heart, lungs, digestive organs, the brain and many others. The knowledge of disease of the teeth as a cause of insanity dates back at least as far as the time of the eminent French alienist, Esquirol. About 1840 he described three cases from his own practice, of patients who regained their reason after recovery from dental disease. Since then similar cases have been put on record by physicians and dentists. These however, have been chance observations in patients who have recovered after relief of dental conditions. So far as I know no effort has been made, until within the last few years, to cure insanity by dental treatment; in fact, Esquirol closes the description of his cases by this statement: "These, however, are facts rather curious than useful, which are isolated, and can never furnish any

* Read before the First District Dental Society, S. N. Y., Nov. 6, 1911. See discussion, p. 72.

Published simultaneously in the Monthly Cyclopædia and Medical Bulletin, Philadelphia, Pa.

therapeutic view, nor guide the physician in the treatment of mental alienation."

Esquirol's dictum indicates for us the problem that is to be solved. It is necessary to find accurate methods of diagnosis, and means of treatment thorough enough to cure. Although in Esquirol's time impossible, the wonderful recent progress of dental science, and the discovery of the X-rays, have given us the necessary means. The subject is one for observation, not for *a priori* speculation. The following histories, given in outline, may indicate some of the possibilities in such cases:

Case I.—A woman forty years old, thin, sallow and despondent looking, was led into my office. She was helpless and dazed, obviously demented. Her history showed that she had formerly been well mentally and physically, although not very strong. She had been depressed and had had occasional headaches for three or four years. She had had no toothache or other pains during this time. A year before I saw her her depression became constant and deepened into melancholy. The headaches disappeared at that time, but she grew weaker and began to have delusions, which steadily increased. She thought she could never recover, and that she had been guilty of many sins. At the same time she was suspicious of her family, accused them of treating her badly, and gradually became mentally confused. Her delusions changed from day to day, and she had no insight into her own condition; her mental power rapidly weakened. Her sleep was disturbed and she ate little. There had been no mental trouble in her family on either side, except for the insanity of a grandmother. The patient had seven brothers and sisters, who, with her mother, were healthy. Her father died in old age. On examination no physical disease could be discovered, except that her teeth were in bad condition, as shown by these skiagraphs.

The decay and exostosis evident in the skiagraphs affected so many of the teeth that it was thought best to extract all of the upper teeth and two old stumps in the lower jaw.

As is usual in these cases, the earliest improvement showed itself in the physical symptoms. Within two or three weeks the patient was taking more food, had gained somewhat in ability to sleep, and her color was better, showing an improved condition of the circulation. She had also apparently gained in weight. Six

CASE 1.—Lower front teeth—Pyorrhea Alveolaris	CASE 1.—Right upper incisor — bicuspid region—decay—abscess	CASE 1.—Right upper molar region—decay—exostosis.	CASE 2.—Caries—abscess — pyorrhea — lower front teeth	CASE 3.—Upper incisor region—abscesses.
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CASE 3.—Left upper molar region—abscess.	CASE 4 — Upper cuspid region—one year after first operation.	CASE 4—Impaction of upper cuspid.	CASE 4 — Upper cuspid region—one year after first operation.
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CASE 5.—Upper cuspid region about a year after operation (extraction of first bicuspid).	CASE 5.—Impaction of upper cuspid against first bicuspid.	CASE 6.—Lower third molar at right angle to second molar	CASE 6.—Impaction of left lower cuspid.
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CASE 6.—Impaction of left upper cuspid.	CASE 7.—Right upper cuspid region some months after extraction of bicuspid.	CASE 7.—Impaction of right upper second bicuspid.	Left upper fourth molar.
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weeks after the operation she talked more intelligently, slept well, and her delusions no longer troubled her. She was decidedly more vigorous, of better color, and, in fact, had made a radical gain both mentally and physically. About a month later, her improvement having been steady, although slow, it was thought best to extract the remaining teeth in the lower jaw. There was a great deal of pus about the gums, and it was feared that this might be a source of trouble later. Following this operation the patient for a time refused to eat, so that it was hard to give her sufficient nourishment. She did not, however, relapse into her previous condition of dementia or of delusions. It seems probable that this refusal to eat was an attempt at suicide, such as is fairly common among the insane during convalescence. Although at times highly dangerous, such attempts, especially in previously demented cases, may be an indication of awakening intelligence and insight. The patient within a few weeks was eating well, made a continuous gain in every way, and at the last report, about two years after the operation, was in better mental and physical health than at any time for many years.

The significant feature of this case is that the patient not only recovered from her attack of insanity, but was restored to a higher plane of health than the one preceding the attack. Her teeth were in such condition as to have constituted a tax on her vigor for many years, possibly even from childhood.

Such cases as this are among the severest and most threatening that the alienist has to deal with. Whether one makes a diagnosis in this case of dementia precox, presenile dementia, or melancholia with profound mental failure makes little difference.

Case II.—Some time since I was asked to see a woman in the sixties, in order to advise as to whether she should be confined in an asylum. Her words and actions had become queer and disordered. She was unable to obtain work, and her landlady was afraid to have her in the house. For some months she had heard voices talking to her and had become possessed of the delusion that a pension to which she was entitled from the government was kept from her by a conspiracy. The woman was thin, pale, not robust. She was uncommunicative, reserved. She said that she felt well, and complained of no pain or other symptom except for occasional dizziness. She had had no toothache. The urgent

feature of her case was that the delusions of persecution to which she was subject were likely at any time to provoke her to deeds of violence against the people whom she thought concerned in the conspiracy. This danger was felt keenly by those surrounding her and they were insistent that she should be confined.

As is frequent in such cases, the woman presented no evidence of any particular disease, although she was feeble. Examination of her mouth showed that her few remaining teeth in the front of the lower jaw were in wretched condition, decayed, dead and with suppurating gums. Such teeth are sufficient, especially in the old, to account at any rate for failing health, and I had no hesitation in advising their extraction. On my advice removal to an asylum was deferred to await the result of the operation.

The first favorable indication after the operation was an admission on the part of the patient that the dizziness from which she had suffered for some months had disappeared. Within five or six weeks it was obvious that she was better mentally. She was no longer insistent in pressing claims about the pension matter, and no longer spoke of voices that had been troubling her. Her improvement from this time was gradual, but steady, and at the last report, two and a half years after the operation, she was in good mental health, and much improved physically. At her age the outlook for recovery of her full vigor is not so good as it would have been ten or fifteen years earlier.

Case III.—The following is an example of the cases that often come under the eye of the dentist. About two years ago a man in the forties went to one of the ablest dentists in Cleveland for dental treatment. He had not been having toothache. The dentist saw that his teeth were badly diseased, and said to him, "Are you ever sleepless or depressed?" "Why do you ask that?" said the patient. "My wife has my revolver hidden away now, for fear that I may shoot myself when my attacks come on." It appeared that the man had been for some years a frequent sufferer from headache, insomnia and melancholy, at times so severe as to make him desperate. The patient was referred to me for examination. Skiagraphs revealed multiple alveolar abscesses. On examination I could find no other cause of his symptoms. Recovery was prompt after amputation of the abscessed roots of four teeth. In this case, as in most instances, full skiagraphic

diagnosis and radical treatment were necessary. The reason why these patients almost always remain unrelieved is that in such cases the dentist is consulted for the obvious dental lesions, and the neurologist investigates the mental symptoms as a separate problem. The physical and mental states are practically never confronted with each other.

Dental irritation is operative in people of all classes, and at all ages. Reactions to dental irritation in childhood are even more interesting and important than those of adults, because dental irritation is more often uncomplicated by disease in other organs, and because undeveloped minds give simpler reactions.

Before speaking of mental aberration in children it will be well to consider one phase of the cases in adults just described, that of recurrence and relapse. It may be asked whether in these cases recovery is permanent, or whether recurrence is to be expected in some instances. Obviously removal of irritants is in no sense a preventive and not protective against future attacks. Cases of relapse are among the most instructive for study. For this reason, instead of reporting new cases among defective children, of whom I have a number under observation, it has seemed better to describe the progress of four patients reported a year ago. These cases are chosen because since their publication (*Review of Neurology and Psychiatry*, Edinburgh, August, 1910) in two of them relapse has occurred.

Case IV.—One of these patients was a boy eight years old, who for two years had been setting fire to buildings and stealing money, horses and other articles from stores. He had been obedient up to the age of six and a half, was still affectionate, but for two years had been incorrigible. Moral suasion and punishment were alike useless.

The boy was brought to me for the solution of a purely moral problem, but I found on inquiry that during his first year at school he had done little in his studies, and during his second year he had accomplished nothing.

The dental conditions found, as shown by the skiagraphs, were of both upper cuspids impaction, and a large filling in the left lower first molar. Otherwise the boy was normal physically. He had suffered from occasional toothache. No connec-

tion between these and his other symptoms had been observed. The two upper first bicuspid teeth and left lower first molar were extracted in October, 1909. The molar with a large filling proved to have an abscess at the root. After the operation his series of thefts came to an immediate end. Within a few weeks he took up his school work, made a record of 90 to 94 in his various studies during the ensuing year, and was reported excellent in deportment. During the following summer, 1910, his mother observed a few minor infractions of the moral law, but nothing serious occurred until the middle of September. Then one Saturday afternoon he went into the business part of the town, took a horse which he found tied in front of a store, drove it to a neighbor's barn, and readily obtained permission to leave it there, stating that it belonged to him. The next afternoon the neighbor came to the boy's father to ask why no one fed the horse. Explanations followed. It was found that the owner had notified the police, telegrams had been sent to all the neighboring towns, and bloodhounds were obtained and put out to trace the thieves. The boy was severely punished, and seemed repentant. On the following Tuesday he stole some groceries that had been left on a neighboring porch, and on the following Saturday was brought to me for further counsel. The case was desperate, as judicial measures for reform could not be delayed if there was a repetition of such offenses.

I found the patient the same rosy-cheeked, innocent-looking child of the year before. An investigation of the dental conditions, however, showed that caries had in the interval made serious ravages. Skiagraphs showed large fillings in three permanent first molar teeth and one bicuspid, one of the fillings as shown by skiagraph being apparently in contact with the pulp. The extraction of these four teeth was advised and promptly carried out. In the bicuspid the filling was in contact with the pulp. In the right lower first molar the filling and pulp were separated by the thinnest possible lamina of dentine.

After this second operation the patient suffered from a good deal of pain in the jaws, was nervous and subject to some aberrations of which I have no definite account. He made a gradual improvement, however, and during the whole time of this moral relapse did well in his studies. The following letter from his

father gives a statement of his condition up to the time of the last report in September, 1911:

"Pardon delay, but have been away and very busy. Mrs. ——— was at hospital during summer for severe operation. Now home and hope for recovery.

"——— passed to advanced grade in school last year, and is now in school and doing quite well. During summer was on farm; worked well. Has grown and has shown none of his former tendencies since early in summer, and not bad then. Is obedient, loving and seems to want so much to please us. A little nervous at times.

"Thank you for interest. Glad to hear from you."

In these two operations, and especially as a result of the last one, the boy's dental welfare suffered severely. More conservative measures would have been followed if they had been possible. Although loss of so many teeth in childhood is to be deplored, the choice lay between that disaster and a more serious one.

Such stirring episodes in a child's career, following a normal infancy and early childhood, are sometimes transient, and as the popular saying is, are outgrown. More often they mark the beginning of a permanent moral or mental breakdown, running its course under the label of one or other of its leading symptoms, and are finally classed as imbecility, insanity or epilepsy.

Case V.—Another of the patients was a little girl nine years of age, who, in marked contrast with the preceding one, was obviously an imbecile. She was undersized, with a small, defective-looking head. She was restless, unable to concentrate her attention on anything, and had been entirely unteachable both at home and in school. She answered the simplest questions in a stupid and unsatisfactory way. She had not suffered from either toothache or other pains. Other important details, which cannot be given here, made it a somewhat complicated case.

The skiagraphs showed impaction of an upper cuspid against the first bicuspid tooth on each side. Following extraction of the temporary first molars and of the first bicuspid teeth in the upper jaw, to relieve impaction and allow the cuspids to come down, the child became quiet, attentive and made fair progress in reading and in her other studies at school. She showed increased in-

telligence at home, and for the first time began to play normally with other children. This improvement continued throughout the school year. During the following autumn the mother was confined to the house by sickness and a severe operation. On her recovery, after the lapse of three or four months, she found that the child had been subjected to sexual abuse by boys in the neighborhood. As a result there were deep ulcers in the vagina, obviously causing great irritation. The child was nervous, and, in fact, under the stress of this renewed irritation, was in complete relapse. This occurred during my absence from the city, and the child was removed to an institution, where she will be given an opportunity to recover from the effects of this terrible misfortune.

Case VI.—Another patient was a girl of twelve, who had been normal until three years of age. Since then she had been nervous and inattentive. It had been impossible to teach her either in school or at home, and she sat about the house in a stupid condition, and refused to play with other children, or to do even the lightest housework. She had occasionally had mild toothaches. Her case had been diagnosed as imbecility at one of the dispensaries.

The accompanying skiagraphs show an impacted cuspid tooth deep in the lower jaw, pressing on the root of the lateral incisor at a right angle, an impacted upper cuspid tooth, and a lower third molar tooth at a right angle with the second molar. Operation on this patient was unusually difficult, and would have been impracticable without ether, or, what is much better in these cases, the Teter apparatus for administering nitrous oxid and oxygen. The lower cuspid and third molar were extracted, and a bicuspid removed from the upper jaw to make room for the impacted upper cuspid.

Following the operation there has been marked improvement in the patient's mental condition. She is enthusiastic in playing with other children, does such housework as making beds and setting the table, on her own initiative, and is generally alert and active. Severe headaches to which she was subject every week or so have disappeared since the operation. This improvement persists, and is apparently increasing at the last report, two years after the extraction of the impacted teeth.

Case VII.—The remaining patient among the four children was a boy nine years old, who was irritable and always hard to manage. He did things well with his hands, but made no progress at school, and his speech was imperfect. He had little command of language, as well as a lisping articulation. A history of only one attack of toothache could be obtained. This occurred four months previously, and lasted about a week. Skiagraphs showed a right-angled impaction of the first bicuspid on the left side of the upper jaw, and of the second bicuspid on the other side. This condition was relieved by extraction in July, 1909. Marked improvement in the nervousness and irritability was noticed soon after the operation, followed by increased power of attention and freer speech. Mental and physical improvement was still well marked a year after the operation. Since then the patient has drifted away from observation.

NECESSITY FOR THOROUGHNESS.

In diagnosis, in addition to ordinary methods of inspection, full skiagraphic study of the jaws is always necessary. The possession of thirty-two well-placed teeth or of no teeth at all is no indication that skiagraphs can be dispensed with.

The attaining of curative results, in fact of any therapeutic results, in cases of nervous and mental disorder, whether mild or severe, is dependent on complete elimination of irritants. Of these facts it will be sufficient to give two instances:

A patient was brought to me in the full vigor of adolescence, whose only indications of disease, aside from slight headaches, had been during the preceding year difficulty in concentrating the mind on its ordinary problems, and a subtle change in morale. This latter consisted in a growing disregard of family ties, and decrease of the affections; a mental status common in the early stages of dementia, whether infantile, precocious, paretic or senile. Absence of organic disease, with teeth normal except for a few fillings, seemed to indicate, as did the mental symptom-complex, a disorder purely psychic. Skiagraphs, however, showed a fourth molar, small, but impacted against the second molar at almost a right angle. Complete relief followed the extraction of the impacted tooth.

The necessity for thoroughness in treatment is indicated by

this extract from a letter received some time ago from a patient. She says: "Following your advice, in May I had my third upper molar extracted" (which was impacted, but not yet through the gum). "This brought no apparent relief in any wise. Again following your advice, in June I had the second upper molar tooth opened and the nerve taken out." This tooth contained a large filling in contact with the pulp chamber. "This proved a great blessing, for I had immediate and absolute freedom from the headaches which before were so frequent and severe." These headaches have not recurred after the lapse of several years. Such a case shows that it may be and often is useless to relieve an obvious lesion, while leaving an obscure one behind.

Operations in the cases described in this paper were performed under nitrous oxid and oxygen, administered by the Teter apparatus. The operations were performed by Dr. Charles K. Teter, except for the second operation in Case 4, for which I am indebted to Dr. D. H. Ziegler.

The advantages of nitrous oxid and oxygen in these cases are that anesthesia may be continued as long as is necessary without interruption, making the more difficult operations on impacted teeth possible in the dentist's office; that shock is less than when ether or chloroform is used, and that nausea and vomiting are practically done away with, and the heart and kidneys not endangered.

In addition to the cases just described I have previously put thirty others on record. In a series of observations the earlier cases should serve as a basis for preliminary conclusions, to be confirmed or rejected by further experience. It seems worthwhile to consider the characteristics of these cases, and if possible to draw from them inferences which may serve to guide further research, and to determine methods of procedure in future practice.

In considering in brief the features common to greater or less numbers of the cases, I shall take the liberty of using the cases described in earlier papers as well as in this one. A good deal of information may be gained by studying the cases from different points of view with reference to the mental symptoms, then according to the location of the lesion, the varieties of irritant lesion, and so on.

SELECTION OF CASES FOR INVESTIGATION.

There are many people nervous and deranged by other than dental lesions, as well as by diseased teeth, and many whose dental disease is as yet nervously well borne. Success of an investigation will, therefore, depend on selection of the cases to be observed. Cases of paresis, of insanity due to syphilis, brain tumor, organic heart disease and many other physical disorders can only be distinguished from those due to dental irritation with any degree of certainty by diagnostic physical symptoms. In children it is especially necessary to exclude cases of cretinism and organic brain disease. A careful medical examination is, therefore, necessary to eliminate aberrations of physical origin, but non-dental.

The majority of patients in private practice are not cases in any way experimental, but are human beings appealing for help. Many have suffered from severe symptoms for years, and are in various degrees demented. They are of all ages from childhood to old age. Operation is often advisable even as a forlorn hope. Many of those past cure show prompt and lasting improvement after operation. An investigation, however, should at the beginning deal with cases adapted to demonstration of the underlying principles involved. Selection should be made from patients not usually recoverable, and suffering from clear-cut, simple lesions. The more hopeless mental disorders of childhood and adolescence, namely, imbecility and dementia precox, are among those furnishing the most striking examples of prompt improvement and ultimate recovery. These cases, however, should be characterized by aberration, not by extinction of mental power.

In selecting cases of moral aberration for investigation, it is necessary to distinguish between the merely vicious and the morbid. Removal of irritation has put so prompt and decisive an end to crime in several instances under my observation, as to make it seem as if such treatment might be a cure for wrongdoing. Obviously this cannot be the case. Clear thinking on the principles involved is necessary if one is to avoid disappointment in dealing with the individual patient.

Confusion of thought with regard to responsibility for crime arises largely from the idea that wrongdoing is abnormal. On

the contrary, what we consider as wrong, and even criminal, is often a natural phenomenon, the ordinary reaction of a healthy individual. Incurrigibility, however, is abnormal, and I believe always abnormal. Normal man is simply a human being endowed with the average inclination to virtue, and the average resistance to vice, with not more than the usual clearness of perception in distinguishing between the good and the bad, but corrigible by rewards, punishments and good example. It is failure to react to the motives for right conduct successful with the ordinary individual that distinguishes morbid from ordinary criminality. Among children the incurrigibles, the nervous, sleepless and those with impulsions and obsessions are among the best for trial of dental therapy. The cases of moral aberration that I have dealt with, seven or eight in number, which have shown such improvement as to constitute practical recovery after removal of dental irritants, have been in patients surrounded by ample incentives to right conduct.

In selecting cases with reference to the dental lesions, cases of impaction give on the whole the readiest answer to the questions that arise in regard to the psychoses, for several reasons. They are severe irritants, often painless, usually not complicated by toxic action. They show by the diversity of their effects the symptoms which may be considered as of peripheral, not of central origin. They may be relieved safely and comparatively easily.

NEITHER KIND NOR LOCATION OF LESION DETERMINES THE CLINICAL TYPE.

The patients who have promptly recovered or greatly improved have shown widely differing forms of aberration, including not only mania, melancholia and other emotional disorders, and mental and moral defects in children, but also dementia as it occurs from adolescence to senility, and paranoid forms of insanity.

There is no difference in the purely mental symptoms to indicate the location of the lesion. No specific symptoms result from impaction of third molars, as compared with the same condition of the cuspids, or of these as compared with the same condition of the bicuspid or incisors. Patients have recovered from

obsessions, from melancholia and from incipient dementia alike by relief of lesion of third molars, and lesions confined to the cuspid region, as well as by relief of lesions distributed more widely through the jaws. Considering any region, the consequences of its disease vary in different patients and at different ages.

If instead of considering the lesions one by one, and tracing their results, we single out each symptom-complex and look for its cause, the result will be the same, no matter what psychosis is selected. The causes of each and every symptom or symptom-complex in mentality are variable, multiple and diverse.

Let us take agitated melancholy for example. My records show cases due to impaction, to abscess, to simple caries; due to dental disease, digestive disorder, disease of uterus and ovaries. The list might be increased almost indefinitely.

This principle is recognized by physicians generally in their daily practice. No man distinguishes melancholy due to heart disease from that of chronic Bright's by the mental symptoms. Diagnosis is only possible by listening to the sounds of the heart and analyzing the urine. The same thing is true of maniacal excitement, of aberrations characterized by morbid fears, and by delusions and hallucinations.

The most that can be said then of either location or kind of lesion as determining varieties of mental symptoms is a statement of probabilities. Indigestion may make more people irritable or depressed than happy, just as heart disease is the cause of more morbid anxiety and fear than of elation, and pulmonary consumption probably has hope and cheerfulness as a consequence, rather than depression. But these are matters of frequency, and do not show a specific mode of reaction.

ABSENCE OF PAIN IS NO PROOF THAT A LESION IS HARMLESS.

Essential in handling these problems is a full and comprehensive grasp of the two facts that pain is a symptom and not a lesion, and that dental irregularity in the form of impaction is a lesion and not a symptom. The doctrine of the harmlessness of lesions is losing ground rapidly. Dental irregularity may be harmless, but when a tooth is driven head on against the peridental membrane of a neighboring tooth, richly innervated,

dental irregularity takes on a new aspect; it becomes a lesion, and is to be reckoned with accordingly.

Suppuration and decay are no better in the teeth and jaws than they are in other parts of the body. An alveolar abscess is always a menace, always a source of greater or less toxemia, with deleterious results on kidneys, heart and blood, as well as the digestive tract; but when, as often, it is pent up, with no outlet into the mouth, it takes on in addition an irritant quality like that of the small amount of pus constituting a felon. It is then not only harmful to the general health, but often early disastrous to nerves and brain.

That painless lesions do harm is apparent in the series of cases under consideration. Even in the individual case it is evident that aberration, insomnia, psychomotor restlessness and the like are not dependent on pain, since they do not vary with it, disappearing as it diminishes in intensity. Whether one studies marked insanity, in which pain is commonly absent, or ordinary cases of toothache, in which the mind is often indeed disordered, but as a rule comparatively slightly, it is equally evident that the nervous and mental symptoms usually either part company with pain, or vary in inverse proportion with it. The patient with toothache is sleepless, restless, despondent, at times when the pain is not in evidence; in dementia precox and other severe insanities local pain is often absent throughout the course of the disease, or early disappears. The lack of definiteness of proportion between the pain and the other symptoms shows that they have among them no relationship of cause and effect, but that in mild as in severe cases the mental state is directly dependent on the lesion.

INSANITY A RESULT OF PERIPHERAL IRRITATION.

It is often assumed that in order to affect the mind a noxious agent must reach its organ, the brain. This assumption leaves out of account the fact that the peripheral nerves, the prolongations of the brain, have as the reason of their being the bringing of mental faculty into contact with the body and the outer world. Nerve fibers bring irritation, though not the irritant, to the brain.

Aside from this, which is a theoretical consideration, the appeal to experience shows that the distant noxious agent is as

disastrous in its effects on the mind as is the poison which circulates. Psychoses due to the pure irritation of impaction are in no way different from those due to alveolar abscess, and critical study of suppurative processes shows that not the quantity of the absorbed pus, but its situation as an irritant, is the determining factor in its effect on mentality. A little pus confined or acting on a nerve as it enters the tooth canal is at times responsible for the severest nervous and mental derangements.

CONCLUSIONS.

Success in solving the mystery of the familiar association of nervous and mental disorders with irregular and otherwise abnormal teeth, is dependent on the thoroughness of the diagnosis and completeness of elimination of the corresponding lesions.

That dental disease furnishes a peculiarly favorable field for research is due to the fact that it is common and usually causes severe chronic irritation, and that the lesions may be actually seen and watched by aid of the X-ray.

Neurologists are daily seeing patients of sensitive nervous organization whose mental balance has been overthrown. The sufferers shrink from pain and avoid the dentist. Many of them have mouths filled with pus and jaws riddled with it, with teeth decayed to the pulp, impacted and exostosed. Study of irritant processes in the body generally, whether by injurious mechanical conditions, intoxications or disease, shows their great effects on mentality. The relations existing between suppurative lesions, misplacement and decay in the jaws, in such a series as the one under discussion, seem to indicate that here, as in other parts of the body, thorough elimination of such lesions is desirable, in fact necessary, to the preservation or restoration of mental integrity.

OBSERVATIONS ON PORCELAIN WORK *

By KNUTT J. LUTTROPP, D. D. S., M. D., BOSTON, MASS.

Appreciating the honor in appearing before you, I take great pleasure in offering the following paper on my haps and mishaps in the field of porcelain work. I do not for a moment claim to have learned the last word in this great art of porcelain restoration as applied to dental purposes, neither do I offer you anything new in this line of work, but in the years that I have experimented I have used about every kind of enamel on the market—Richter's, Jenkin's, Ash & Son's low, S. S. White's and Brewster's high—and I am to-day not an ultra enthusiast, but a firm believer in the value of porcelain inlays, when properly made and inserted. I regret to learn that so many of the profession have abandoned the porcelain work, which they began with so much enthusiasm some years ago, and these same men to-day will tell their patients that the porcelain inlay is a failure.

In order to make a success of porcelain, one must love his work, give close attention to detail, be possessed of infinite patience, some mechanical ability and artistic taste.

I have often asked myself the question, Should porcelain be taught to students in our colleges? This question has been forced upon me by the fact that in teaching I have found it difficult to arouse any enthusiasm in the student, who in a short college career is so wrapped up in his gold fillings that he is unable to devote his time to this particular work. For no man ever made a real success unless the most intense interest was concentrated upon the achievement of that success. My impression is, however, that a few lessons to the student is an excellent thing, as it gives him, who in later years may discover a leaning towards porcelain, an idea of its value, and a knowledge of its technique. There are some important considerations in the use of porcelain, and paramount comes the question, Is porcelain as used for restorations a practical success? The answer is paradoxical—it is and it isn't. It is a success when it restores the individual tooth in as uniform and rational way as it is possible to restore it by artificial means. With its cement lining, it not only pre-

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serves the tooth, but, being a poor conductor of heat, we very seldom find dead pulps under these fillings. The inlay is not a success when the operator shows lack of attention to detail and appreciation of adaptability, and poor judgment as to position, and with regard to stress of mastication.

No inlay when inserted should depend entirely upon the cement used in setting for its retention. The formation of the cavity, with its seat, should be the principal factors.

Are there more beautiful operations performed on the teeth than properly restored tips and corners of the incisors, where in previous years we labored long and hard to build them out in gold? The porcelain inlay serves various purposes. It is permanent, it resembles the enamel in character, and it approximates the natural arrangements of the teeth.

You may very naturally ask the question, What do I mean by permanency? In my observation of inlays for ten years, I have found that many inserted years ago, with the exception of the appearance of the well-known cement line, are protecting the teeth, and doing the same good service that they were at the beginning. It is a well known fact that inlays never fall out through excessive washing of the cement line. There is no doubt that the porcelain inlay would be practically as permanent as a well-built gold filling were it not for the unfortunate cement line. Careful observation has shown me that inlays made not only from burnished matrices, but also from swedged ones, show, when in position, an opening so minute that it is hardly discernable. The cement filling, this tiny aperture, does undoubtedly wash in some mouths more than others, and allows infinitesimal collection of food, bacteria and acid secretion, which in time will cause disintegration of the enamel edges, and sometimes consequent disfigurement.

In some teeth, and in some mouths, irrespective of the apparent result at the beginning, the cement line becomes more noticeable than in others where the inlay is less perfectly made.

One phenomenon that I am at a loss to understand is the more rapid washing of the cement on the labial surface than on the lingual. I might say at this time that when we achieve the ideal plastic filling that will not wash or stain, then the porcelain inlay, with its exacting details, will be relegated to a less promi-

ment place in our work. Notwithstanding the extent to which the so-called silicate fillings have been developed, they are far from ideal, especially in corners and tips. They have their use, and serve their purpose for a time, but they wash and discolor.

In the permanent incisors of children where the usual excavation with retentions would be extremely painful there seems to be an excellent field for the use of porcelain. Here sufficient excavation is not very painful, no grooves or pits being necessary, and the teeth are properly approximated by the restoration. In all such cases we must be certain of a sufficient separation previous to the work of matrix making, in order to insure an easy removal of the matrix intact, and the insertion of the finished inlay. A considerable separation is not necessary in large restorations where the seat of the inlay is open from the lingual aspect.

The inlay field is broader to-day than ever, thanks to Dr. Welden, who has evolved an ingenious device for casting inlays in porcelain, from an impression something on the order of Dr. Taggart's gold inlay method. It is an excellent idea and demonstrates the advance over former methods, where the shrinkage of porcelain in bulky fillings during the baking caused considerable warping of the platinum matrix.

Just a word about my failures. In the beginning I prepared my cavities saucer-shape, with beveled walls, giving the inlays when finished feather edges, and used German and English enamels. These edges soon become discolored (this result would undoubtedly occur with the high-fusing bodies as well). Inlays that when finished were beautiful to behold returned after a year's time looking as if the patient had just partaken of a blueberry pie, all the blueberries on the inlay. Patients would sometimes return with the inlay in a box. I was almost at my wit's end, and made a solemn vow to go no further with the work, so great was my disappointment; but soon I was hard at work again with other bodies, and different methods of preparation; and this time my labors were less discouraging. My efforts met with a success which to me was most gratifying.

CAVITY PREPARATION.

In our ideas of cavity preparations we all may differ, and

it is unwise at this time to enter into the matter deeply. What few exhibits are shown will give you an idea of my methods. It is sufficient to say the cavities are prepared with square walls, slightly inclined toward the center of the tooth, and the enamel edges finished with small stones, preferably the "gem" points. These points can be turned down small enough to enter any opening.

It is my custom to prepare the cavity without the use of the dam, as the tooth is then wet, and the enamel less likely to check, after which the rubber may be applied, the moisture carefully removed, and margins examined with the magnifying glass.

IMPRESSIONS AND MATRIX MAKING.

This is usually done without the employment of rubber dam. For the matrix I use No. 1,000 platinum foil for large fillings and corners; for smaller cavities, a thinner gauge, a 2,000. A piece of platinum is chosen, large enough to cover two-thirds of the tooth. This is pushed well above the *cervical* margin of the cavity and held in place with thumb and forefinger. A large pellet of cotton is then used to drive the slack part of platinum foil in the body of the cavity, firmly wedging the metal in place. With the fingers gently work the protruding edges over the labial and lingual surfaces of the tooth. Now remove the matrix, and trim away surplus metal. Replace and burnish into position with instruments made for the purpose. By carefully manipulating the burnishers, the platinum may be spun into the cavity without rupture.

In deep cavities a break in the center does not mean failure, providing the margins are perfect. The matrix may be removed and annealed. If it appears to work harshly under the burnisher heat to a white heat and allow to cool slowly.

When matrix is fully fitted, and conforms without rocking in the cavity—this is important—it is gently coaxed from its position and placed on the platinum tray.

In certain extensive cavities and tips amalgam molds may be made from impressions, and the matrix formed in a swedger, in which case it becomes tough and has less tendency to warp in the baking.

It is my custom to replace the matrix in the mouth and re-

burnish, when baking is two-thirds completed. Notice that the matrix stands squarely on the tray, another safeguard to avoid twisting. Some thin enamel is now painted on the tray and baked, soldering the matrix to the same, and holding it firmly in position.

After experimenting with various porcelains, I am now using the S. S. W. high fusing, with best results. When, as is often the case, I have several inlays to bake, and must perforce wait some days before the same can be arranged, it is my custom to draw a diagram of the tooth on paper, indicating position, shape and shade of inlay.

Selecting the shade is important, and is a matter of judgment and conception of color. Three distinct shades may enter into coloring of an inlay, without intermingling so as to lose character.

The body is now prepared with a mixture of two-thirds water, one-third alcohol and a small amount of gum tragacanth. This forms a paste easy of manipulation.

The porcelain is built up from the center of the matrix, extended out in a straight line to the full contour.

The greatest shrinkage is in the region of the greatest bulk, and is likely, after one or more bakings, to leave a "V"-shape opening at the cutting edge. This is overcome by painting the matrix at this place at each baking, except the last one, with a thin solution of shellac, which burns off by the heat, and leaves a small opening next to the metal. At the last firing, this opening is filled with enamel, and the result is an elimination of the defect to a great extent.

I should say here that the previous bakings have been merely biscuiting, and the final heat completes the fusion of the mass. An inlay should when finished never extend over margins.

The cementing of the inlay in a tooth is as important as any of the preceding details. After the platinum foil is removed, either by peeling or using a small wheel burr on adherent portions, a thin rubber and carborundum stone is used to cut a groove in the long axis of the inlay, forming a dovetail. The remainder of the surface is roughened with a stone, carefully guarding the margins. The rubber is adjusted, the cavity thoroughly sterilized and dried, and the floor roughened with a small burr.

The Harvard cements, carefully spatulated with a bone or agate instrument, seems the best adapted setting medium. It appears to blend best with the tooth substance, and if allowed to crystallize for fifteen or twenty minutes becomes almost adamantine in hardness.

The thin cement is smeared into the cavity, and over the roughened surface of the inlay. The porcelain is now placed in position, and, with a silk ligature across the center, carefully worked into its seat, and tied securely in place, *as the cement should set under pressure.*

The patient may now be dismissed, with instructions to return in a few days, when the edges of the inlay should be gone over with a fine Arkansas stone.

It is manifestly an impossibility in any written effort to furnish a perfectly satisfactory clinic, but I should be very glad indeed to give a demonstration of the practical side of this porcelain work to any brother practitioner who may care to see the work and the results of every-day operations in my office.

DISCUSSION OF PAPER BY DR. KNUTT J. LUTTROPP.

Dr. Mackay—Dr. Luttropp said that the days of porcelain were passing and that silicates are now in order. I agree that this was the case, but think that the tide is now turning. The general rule should be to fill teeth as permanently as possible. We all realize the readiness of the dental profession to take up new things. I think in the porcelain matter we have something worth while. The age has gone by in which we could build prominent gold corners in the front teeth of intelligent patients. I should prefer gold in the approximal cavities of the bicuspid.

Dr. Stanley—I think porcelain like all other materials has its place. I do not think silicate cements are going to take the place of porcelain in the future. I have had my day of working porcelain. I have recently taken it up again, but have used the indirect method. The impression is taken and sent with the shade to a laboratory and good results are obtained. In many cases we will get a more accurate fit in this way than by making our own inlays.

Dr. Brigham—We dentists do not have enough of these practical papers. I do a great deal of porcelain work, some of which has been of no credit to me—some of which has been. We have no filling material that has the range of adaptability of porcelain. I build up molars with these large restorations. The porcelain filling must either enter the tooth with parallel walls or it must slide in a box-like fashion and lock itself in. I dovetail the incisal fillings in so that they cannot be dislodged unless they slide upon themselves. The distal cuspid cavity is an advantageous place for porcelain. I have seen no reason to change from Jenkins' low-fusing porcelain. You can fill many cavities and have the patient gone in three-quarters of an hour.

Dr. Patten—I am always glad to see Dr. Luttrupp's work. While I am not using porcelain as widely as I did ten years ago, I continue to use it. In all labial cavities it is the only filling to use. The most important point in baking is low heat, with plenty of time. Porcelain as dense as that obtained by the process of baking the porcelain under great pressure cannot be obtained by fusing in a matrix. Last year Dr. Woert showed me some crowns in which the foundation cap had been swedged in an amalgam die. Then the base was burnished, then transferred to a small press, where the porcelain was forced into the die and pressed down around the head of the pin. Considerable pressure was exerted. The cap, with the mix, was allowed to dry out and the porcelain biscuited. Then it was removed and trimmed and baked to a glaze. The pressure which was applied was greater than that of the manufacturers, hence the shrinkage was less; in fact, there was but one one-thousandth of an inch, and the texture was much superior.

Dr. Ainsworth—I doubt if there is a man in this vicinity whose judgment on porcelain I hold in greater respect than the Luttrupp brothers. No practitioner is properly equipped to practice to-day unless he is able to apply porcelain work when it is indicated. My experience has been more in the preparation of cavities than in the making of inlays. To-day we can take an impression, pass it out to one of the laboratories who are doing the work and receive the inlays ready to be set. I often mix the cement powder with water to ascertain the best color to be

used in setting the inlays. I have seen very many ill-fitting porcelains that were giving excellent satisfaction.

Dr. Andrews—I do not consider myself a porcelain worker. To get a perfect fitting matrix we may first press cotton into the base of the matrix, then remove it and press the latest Taggart inlay wax against the platinum in every portion of the cavity, including the margins, cool the wax, remove it with the platinum and pick out and wash out the wax. The great difficulty before with many has been to get out the matrix without distortion. The weakest part of any of these pieces of work is the cement. In regard to silicates, I have had both success and failures. The other day while cleaning teeth I felt a roughness which on examination proved to be an Asher's filling, which was unnoticeable before. Tooth soreness is its worst feature where the cavity is large. Asher's enamel cannot be depended upon. It saves the teeth but the fillings and adjacent tooth margins are discolored.

Dr. Brigham—In setting inlays I have for several years used Harvard cement. I now use Ames' cement. Its tough, rubbery, plastic consistency is admirable. I think Asher's cement ought to be cut out of any discussion. No man can hold a practice long and use Asher's cement.

Dr. Cooke—In regard to the essayist's statement that the dissolution of the cement line around the porcelain was greater labially than lingually I agree. It is caused by the acid formed in the decomposition of the food. I approve of sending, say, six men at a time for Dr. Luttropp's instruction. The expense per man would be small and the benefits great.

Dr. Faxon—In setting the inlays I find repeated light taps set the inlays better than does a steady pressure.

Dr. Luttropp (closing)—In some cervical inlays if you break them while in the matrix, fit to the cavity, fill up the cracks with porcelain and then re-fuse, you will overcome the tendency to shrinkage and distortion and get these long cervical inlays to fit perfectly.

A STUDY OF THE MAXILLARY SINUS *

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The nasal accessory sinuses are air spaces of varying sizes situated in the maxillary, frontal, sphenoid and ethmoid bones. Galen said their function was to lighten the bones of the head; others say they are air cavities and assist in the resonance of the voice. Ballanger says they are the residual remains of the olfactory organ. In the lower animals they are largely developed, but in man are not needed, and so have become gradually closed off from the nose. They are lined with mucous membrane continuous with the interior of the nares, so it is easy to understand that any inflammatory or infectious process affecting the nasal chambers, proper, may extend to and involve the sinuses.

Great advance has been made in recent years in our knowledge of the diseases of these cavities. Because of the lack of adequate drainage and ventilation of these air spaces, due to their small outlets, and the ease with which these openings become obstructed by inflammatory changes within the nasal cavities, pathological conditions frequently result and are often treated as catarrh, for long periods of time, the real condition being overlooked. An obstinate and offensive nasal or postnasal catarrhal condition should be suspected as disease of one or more of the sinuses.

The four sets of sinuses are in pairs and are situated mainly above and to the outer side of each nasal fossa. Hajek has divided the sinuses into two groups: first, those having their openings so arranged that they drain into the middle meatus below the middle turbinate, and, second, those whose drainage is above the middle turbinate. The first group comprise the frontal sinus, the anterior ethmoidal cells and the maxillary sinus; the second, the posterior ethmoidal cells and the sphenoidal sinus. The usual route of infection is through the nasal passages, but, because of the nearness of the roots of the teeth, the maxillary sinuses have a source of infection the other sinuses do not have. While it is possible for one sinus alone to be diseased, we often find simul-

* Read with stereopticon illustrations, Dec. 13, 1911, before the Boston and Tufts Dental Alumni Association.

taneously more than one involved when the infection takes place through the nose, but if the cause is a diseased tooth the maxillary sinus alone may be infected. Ballenger says the cause of maxillary sinusitis is about equally divided between infection from the nose and diseased teeth, and because of its dental association the maxillary is the most frequent singly affected sinus. For this reason again, as I have said on former occasions, the dentist and the rhinologist should be closely correlated.

The face is made up of fourteen bones, with its various cavities and air cells or sinuses, and is a very intricate, as well as interesting, structure. In its formation heredity, race, customs and parental health are great factors, and must always be considered, but in the final result the law of growth has a great influence. If the various structures fuse or adapt as nature intended, and growth is normal, then we have practically symmetrical development. Malformations, however, are intensified once growth has started.

The head at first consists simply of a cranial cavity. The face develops later by a series of arches, with clefts between them. Early in foetal life the fore brain region bends forward ventrally, almost at right angles to the long axis of the body, and subsequently the naso-frontal process develops. Just below this process and from the sides the first branchial arches develop. These grow forward and fuse in the mid-ventral line, forming the mandibular process. From the upper portion of this mandibular arch the maxillary processes develop. They grow from each side toward the median line and fill in the space between the mandibular arch and the naso-frontal process.

These various structures bound a distinct depression on the ventral side of the head, which is the oral pit. This is the beginning of the oral cavity. The maxillary processes give rise to the upper jaw and most of the lip and face region. The mandibular process gives rise to the lower jaw, the chin and two auditory ossicles. On each side the groove between the maxillary process and the mandibular process marks the angle of the mouth, while the groove between the maxillary process and the naso-frontal process is the naso-optic furrow, at the dorsal end of which the eye develops.

The beginning or anlage of the organ of smell is apparent

in the human embryo at about the third week, one on each side of the naso-frontal process. They are called the olfactory placodes. At four weeks they become depressed below the surface, thus commencing the nasal pits. These depressions or pits appear on the ventral border of the naso-frontal process, near the median line, and become the nostrils or the external openings of the nasal passages. The part between the two pits called the medial nasal process gives rise to the nasal septum and the middle portion of the upper lip. The lateral side of each nasal pit forms the lateral nasal wall and wing of the nose. With development the nasal pits grow deeper into the mesoderm and become sacs or channels, which lie above the oral cavity. Later these sacs at their posterior portion rupture into the mouth, forming the primitive choanae, or posterior nasal openings. These sacs correspond to the superior meatuses, or the olfactory portion of the nose. In front of these openings, the nasal passages or nasal sacs are separated from the mouth cavity by tissue, called the primitive palate.

From the medial side of each maxillary process a plate-like structure appears (from the forty-fifth to the forty-eighth day) and grows across the primitive oral cavity toward the median line. These are the palatine processes, which meet and fuse with the lower part of the septum. By this means we have a distinct shutting off of the nasal and oral cavities; the palatine processes form the hard palate, which is the dividing line of the nasal and oral cavities. In this way the floor of one cavity and the roof of the other is formed. A space is left at the posterior portion of the palate for the communication of the nasal chambers and the pharynx, while at the anterior portion a triangle is left for the insinuation of the incisive bone. The palatine processes fusing in the middle line form about three-fourths of the hard palate. The incisive bone which completes the hard palate in front is derived from the fronto-nasal process and not from the maxillae.

The nose itself is at first broad and flat, but becomes elevated above the surface of the face on elongation and narrowing of the bridge and is perceptible at the end of the second month, although its anlage is apparently established by localized thickening about the third week of embryonic life. The nostrils

are at first closed by epithelium, but this disappears about the fifth month of foetal life.

The nasal cavities increase in size in three ways: first, by the formation of the palate; second, the development of the turbinates, and, third, the development of the accessory sinuses.

All the bones which go to make up the face commence to ossify by the seventh week (forty-ninth day), except the vomer, which does not have any center of ossification until the sixth month.

At the thirty-fifth day the lateral wall of the nasal fossa is very simple; at about the fortieth day the inferior portion of the lateral wall just above the palatal processes begins to bulge toward the lumen of the nasal fossa. This is the beginning of the inferior turbinate; four or five days later a second fold appears, superior and dorsal to this. It is the ethmoidal fold, or the beginning of the ethmoidal turbinate, which further divides, making two or more turbinates. Thus we see slight ridges form, with depressions just above and below, which gradually deepen into furrows, and thus are formed the turbinates and the meatuses. These folds and projections develop before the cartilage is formed. The lateral wall of the middle meatus of a forty- to fifty-day embryo is even, but at sixty days it begins to show its complicated structure. Growth is very rapid; four weeks later, or at ninety days everything is completed—even the foetal heart may be heard. The uncinate process begins to show at sixty days, and above it the bulla ethmoidalis, and the hiatus semilunaris between them. It is through this slit the infundibulum ethmoidale communicates directly and the primitive maxillary sinus indirectly with the middle meatus.

At the seventieth day, or tenth week, there begins a slight epithelial pouching or evagination of the mucous membrane of the primitive infundibulum ethmoidale. This is the beginning of the sinus maxillaris, pushing from the furrow between the inferior and middle turbinate. It is a minute epithelial sac which extends in two directions, downward and upward, and appears before the cartilage, which later surrounds it. The descending branch is the maxillary sinus, while the ascending portion widens, and at the third month of foetal life begins to form the frontal sinus. This latter is so small it is generally considered not to

exist at birth. Turner says the frontal sinus begins to develop at the end of the first or beginning of the second year of life as an expansion of the ethmoidal labyrinth.

The sinus maxillaris after pouching develops and occupies a definite space in the lateral wall of the nasal fossa by the end of the third foetal month, and continues to push downward, forward and outward, and only slightly toward the orbit. With the growth of the nasal fossa backward and upward, and the development of the ethmoidal labyrinth the inferior turbinate gradually assumes the adult form during the late stage of intra-uterine life. All the sinuses develop from preformed furrows, except the sphenoidal, which is a constriction of the dorsal and superior part of the nasal fossa.

The anlage of the maxillary sinus is usually a single pouch; sometimes there are two, which grow side by side from the infundibulum ethmoidale. The pouching varies much in extent, and the size and shape of the ostium maxillare, or natural opening of the maxillary sinus, depends on the pouching and duplication. It may be a small aperture, or a long slit, or a double opening. At first the maxillary sinus is a slit-like cavity in the lateral wall of the nose. By resorption of cartilage and bone and growth of sac the sinus simultaneously extends into the maxilla, keeping pace with the growth of the face. Thus the cavity within the bone is formed, with its opening in the upper and inner portion of the sinus.

In the embryo the processus alveolaris of the maxilla is near the orbit; therefore, the sinus must be very small at this time, for the unerupted teeth are formed there. The age of the child and the size of the sinus progress together. At birth the sinus measures (ventro-dorsally) about 7 mm., at twenty months 20 mm., and as a rule has extended above the rudimentary permanent first molar teeth. The sinus reaches its full size at the fourteenth to twentieth year, when it is the largest of the accessory sinuses of the nose. Age and sex and dentition seem to have little to do with its size, except perhaps in females, where it is slightly smaller. Before and during dentition the maxillary sinus is separated from the front of the maxilla by the unerupted teeth. After the eruption of the deciduous teeth the cavity is rounded and elongated in form, until after the eruption of the

permanent teeth (twelfth to eighteenth year), when it has become gradually pyramidal, or the adult shape. (The range of capacity of the adult sinus is 9.5 c. c. to 20 c. c., or an average of 14.25 c. c.) Occasionally the sinus is very small in size, but is seldom absent.

Just as the size of the sinus varies, so also do the sinus walls vary in thickness; they may be thick or thin as paper. The adult sinus is pyramidal in shape, the base toward the cavity of the nose, the apex toward the zygoma. The thinnest portion is the naso-antral wall, near the ethmoidal bone. This is the hiatus semilunaris, which is at times merely a fibrous membrane. The basal wall sometimes bulges into the nose. The thickest portion of the wall of the sinus is the zygomatic portion. The anterior wall of the sinus is comparatively thin in the canine fossa. This is a safe region to make a large opening into the cavity. The roof of the sinus is the floor of the orbit. The floor which is formed by the processus alveolaris varies in thickness in different people and on the same skull. Sometimes the floor of the sinus may be thrown into irregular elevations by the roots of the teeth. When the spongy bone is thin or the processus alveolaris of the maxilla is markedly hollowed out the floor of the sinus is at a level *inferior* to the nasal floor. When thick, the floor of the *nose* is inferior to the sinus floor. The majority of sinuses have their floor at varying distances inferior to the floor of the nose. Schaffer examined sixty skulls. In thirty-nine he found the *sinus floor* was inferior; in twelve the *nasal floor* was inferior and only nine on a level. Thus we see not only does the antrum vary greatly in size and shape in various skulls, and on the two sides, but also in position, so the relation of the teeth to the sinus cannot be constant, for the alveolar process varies in thickness. When thin, the tooth roots are elevated more or less in the floor of the sinus. The three molars are the most constant in direct relation to the sinus, but when the sinus is small only the second and third molars. With a very large sinus all the teeth may be in direct relation. When the canine wall and the nasal lateral wall are simultaneously approximated the canine and molar teeth are not at all in direct relation to the sinus. A drill following the tooth socket would enter the floor of the nose and a trocar through the nasal wall would enter the cheek unless directed

upward. Direct communication between the roots of the teeth and the mucous membrane of the sinus occurs more frequently in the aged. The thicker the alveolar process the greater the protection against inflammatory inroads into the antrum from the teeth. The inner surface of the antral cavity has frequently crescentic projections or septa, which materially interfere with thoroughly draining the cavity, unless a large opening is made.

Normally there is but little secretion in the sinus, only enough to keep the mucus membrane moist, but if diseased, secretion is increased, the ciliated epithelium assists in carrying it toward the natural opening. If because of disease the cilia are destroyed then gravity and position must be relied upon to drain the cavities. This, of course, means imperfect drainage and retention. The outlet of the frontal sinus and anterior ethmoidal cells is high up and at the anterior end of the middle meatus. A slightly curved channel leads downward and backward under the middle turbinate; the lower border of this channel is the uncinate bone and guides the drainage from these cavities backward in the middle meatus. About half way back in this meatus is located the natural opening of the maxillary sinus in the dorsal portion of the hiatus semilunaris. If there is an accessory antral opening it is in the anterior portion of this space, and in 50 per cent. of the cases connects directly with the middle meatus. When present the secondary ostium is lower down than the natural opening. Thus discharge from above guided by the uncinate process would flow directly over and into the antrum, making it a reservoir for the collection of secretion, although not necessarily at first itself diseased. An accessory opening to the maxillary sinus means easier nasal infection, as well as better drainage.

In 1851 Dr. Nathaniel Highmore reported a case of a female patient for whom a left canine tooth was extracted and pus was drained from the sinus. Since then the cavity has been called the antrum of Highmore. While the antrum in infancy is small, it is large enough to become infected. Byran reports a child, aged eight, with acute maxillary sinusitis, due to caries of a canine tooth. Shurly, one of eight weeks due to traumatism by forceps during delivery at birth, and Morse an infant of three weeks from premature eruption of a tooth.

The antrum of Highmore may have acute or chronic inflammatory changes affecting the mucous membrane, necrosis of its walls, cysts and tumors (benign and malignant). There may be an acute or chronic catarrhal condition, or an acute or chronic purulent empyaema. The acute diseases affecting the nose may cause the same condition in the antrum, producing similar changes in the mucous membrane of the sinus. A suppurative process around the roots of any tooth which is in relation may easily infect the antrum through the lymphatics and blood vessels or a carious fistula. A diseased crown may by extension through the lymphatics be the source of antral infection. In acute empyaema we have hyperaemic thickening of the mucosa, with its surface covered with pus, which may cause ulceration and caries, or may terminate in a chronic empyaema. In the chronic empyaemic form the mucosa gradually thickens with pus formation. The normal thickness of the mucous membrane is one-twenty-fifth of an inch, but it may increase to three-eighths of an inch with disease. The antral cavity may become filled with polypoid masses. Usually the empyaema is unilateral; it may be bilateral.

The chief symptoms of empyaema of the antrum is pain and discharge of pus from the nose. In acute empyaema pain is more frequent. Its severity depends on how much retention of secretion there is—that is, if it is an open or closed empyaema. When pain is present it is generally intermittent, and in the infra-orbital or malar region, or in the molar teeth of the upper jaw; the molars seem too long when closing the jaws. Rarely the pain is in the orbit or toward the ear. There may be tenderness to percussion under the eye or in the canine fossa. With free discharge from the sinus the pain and tenderness is less or not at all. The sense of smell is usually affected more or less. The patient may complain of an odor on nasal inspiration. Usually there is not much external swelling, but pus is seen in the middle meatus, together with swelling of the nasal mucosa. Pus collects in the sinus during sleep, but upon assuming an upright position in the morning drainage takes place, relieving the discomfort or actual pain. The latter part of the day the amount of discharge is much less than in the morning. The patient is subject to frequent colds. In long continued cases,

or if infection is from teeth, the discharge is more apt to be fetid. In acute cases the pus is often bright yellow.

The diagnosis of antral sinusitis is made objectively by the appearance of the mucosa of the outer wall of the nasal passage, the presence and location of secretion, also by transillumination and the X-ray. Subjectively, by sensation of pain and pressure, tenderness on percussion and disturbance of the sense of smell. The history is very important, especially in regard to carious teeth and frequency of head colds. Unilateral nasal discharge of pus, with or without pain, in an adult is indicative of sinus empyaema. The value of transillumination depends on comparison of the two antra. If one is dark and the other light it shows conclusively the antrum is affected, but we still have to determine whether the anterior ethmoidal cells or the frontal sinus are involved. With the aid of cocaine, antral puncture is simple, causing little pain, and is a positive aid in diagnosis. While this may be done through the middle meatus, it is more difficult, because the middle turbinate obstructs and the orbit is near. The best route is through the inferior meatus high up under the inferior turbinate. Perforation of the canine fossa by drill is now obsolete. It is, however, justifiable to explore with burr or drill through the root cavity of a second bicuspid or molar tooth. The drill should be pointed toward the supra-orbital nerve, to avoid the nasal cavity or cheek muscles. If pus is found either through the nasal puncture or the alveolus, we may thoroughly wash out the cavity with normal salt solution daily for a short time. If then a cure is not obtained we must pursue more radical methods. In my hands enlargement of the opening in the inferior meatus, so that curettement and complete drainage may be obtained, has been very successful. The more extensive Kuster, or, better, the Luc Caldwell operation, through the canine fossa, is necessary in obstinate cases. By this operation actual inspection of the sinus may be obtained.

222 Huntington Avenue.

PROGRESS IN THE ELIMINATION OF PAIN IN DENTISTRY*

By CHARLES A. JAMESON, D.M.D., Boston, Mass.

History shows that the effort to eliminate pain is not new. As early as the third century the Chinese produced a partial anæsthesia from the fumes of hemp. The Greeks and Romans at the height of their civilization obtained a certain indifference and insensibility to pain by the use of mandragora, probably by inhalation. But not until the beginning of the nineteenth century can we say that the real foundation of our present knowledge of anæsthetics was laid.

In 1800 Sir Humphrey Davy discovered in his chemical experiments the anæsthetic effect of nitrous oxide, and, it is said, suggested its use in surgery. This suggestion, however, remained unheeded for nearly fifty years, until in 1844 Dr. Wells, attending a public demonstration of nitrous oxide, conceived the idea of applying its use to the painless extraction of teeth and consented to have one of his own teeth removed under its influence. The operation was highly successful, but unfortunately a public demonstration by himself in Boston a little later proved a failure. This circumstance, together with the fact that ether was just arousing widespread interest in the hands of Dr. Morton, pushed nitrous oxide to one side for almost another quarter of a century, until, in 1863, Dr. Colton, who had first administered it to Dr. Wells twenty years previously, founded the Colton Dental Association in New York City for the painless extraction of teeth, an association with which we are all familiar.

The next step in the perfecting of nitrous oxide anæsthesia was taken by Professor Andrews, of Chicago, in 1868, who found by long and careful experimenting upon animals that by mixing oxygen with nitrous oxide a subject could be kept indefinitely in the anæsthetic state without the usual asphyxial symptoms. At this time these experiments seemed to have aroused little interest. In 1878 to 1880 the elaborate investigations of Paul Bert, the French physiologist, proved beyond a doubt the wonderful results

* Read before the Harvard Odontological Society, Jan. 18, 1912.

to be derived from the mixing of the two gases. From this time on nitrous oxide and oxygen were used extensively by the dental profession.

Looking back upon the accomplishments of our profession in the development of anæsthesia, its application to the relief of pain in extracting and the use to which the surgeon has put this knowledge, it seems almost incredible that we should have made so little effort to apply some form of anæsthesia to our work. I quote from Dr. Rhein, who says: "We as a profession occupy a unique position, inasmuch as we claim to have first introduced the benefits of general anæsthesia by means of nitrous oxide, and yet to-day we find ourselves in the lamentable position of being subject to the criticism of the medical world because our work is so much dreaded and feared by patients." When a patient says, as one did not long ago after a recent hospital experience, that the operating table had no horrors compared to the dentist's chair, I am forced to admit that the common accusation that we are simply mechanics and lack the true professional spirit bears some semblance to the truth.

We are neglecting a most important side of our work in not bending every effort to lessen the agony to which we daily subject our patients. To the argument that in doing this we are pampering our patients and lessening their moral strength, I have nothing to say; it seems to me too absurd to discuss. This same argument was used, particularly in England, in the early days of chloroform and ether.

My own experience in the effort to relieve pain has probably been not unlike that of many others. Cataphoresis was pronounced a failure as I was about to begin practice, so that this I personally never used. The nearest approach to success up to a year ago was with the high-pressure syringe. With this results were obtained, but injecting cocaine into a tooth-pulp under, perhaps, several hundred pounds pressure, was a risk I seldom cared to take. Dryness of cavities, drugs and sharp burrs have not accomplished the desired end. The results have been so slight as hardly to be worth mentioning.

In October, 1909, Dr. George T. Gregg, of Pittsburgh, gave a paper before the New York Odontological Society describing his method of using nitrous oxide and oxygen for sensitive den-

tine with the Teter apparatus. His results seemed so remarkable and his conclusions so reasonable that I decided to give this method a trial. This I did, using the machine of Dr. Cross instead of the Teter used by Dr. Gregg.

Although my experience with it has been comparatively limited, the results in the year that I have been using it have been so satisfactory that it is hard to conceive of any one being willing to practice without some apparatus of this kind. It may not be out of place to describe briefly the method of using it.

A knowledge of the peculiar temperament of your patient is very necessary, that you may gain his confidence and allay as far as possible the natural nervousness occasioned by taking an anæsthetic for the first time. I find that it helps greatly by saying very little about the nitrous oxide, but laying stress upon the oxygen, explaining how large a part this plays in the anæsthesia, as well as speaking generally of the well-known characteristics of this gas, its life-supporting qualities, etc. I also try to convince the patient that it is not to be forced upon him, but is under his control; the mouth being free, he is at liberty to regulate the supply of the anæsthetic himself. I also urge him to endure a little pain, taking only enough of the gas to make the pain bearable. This I do on general principles, for this avoids the dread natural to many people of losing consciousness and must necessarily lessen the danger of any after-effect. I do, however, find there are a few of a highly nervous temperament who insist upon being carried to the point of absolute loss of consciousness. In these cases I have no hesitancy in carrying them to the deep anæsthetic state. In the removal of severely inflamed pulps this is usually necessary. In the matter of proper breathing I have found it necessary to say but little; if the confidence of the patient has been secured the inhaling usually takes care of itself. I believe that to properly administer any anæsthetic we should first take it ourselves, for in no other way can we meet properly the natural fears that come to our patients.

In regard to the proper mixing of the gases there is no absolute rule to follow. I have found, however, that ten per cent. oxygen is a very large proportion, anything over this bringing on symptoms of excitement. With patients who are accustomed to taking it, in many cases the oxygen from the apparatus can

be cut out altogether, depending upon the air for the necessary oxygen.

Dangerous symptoms: So far I have had none. After effects: In my one year's experience I have had three cases of nausea, two slight, one serious. The latter could have been avoided had the proper care been taken in regard to eating before coming to me.

To show what an effective agent this method can be in our hands this example comes to my mind:

A young woman of strong will, but physically frail, came into my hands a short time ago. She was willing to endure anything to have her teeth put into perfect condition. I used every effort to do the work thoroughly with a minimum of discomfort. But after she had fainted at two different times in my chair, each being followed by a severe illness, in which she was under the care of a physician, I refused to do anything but temporary work, much to her disappointment. She was naturally one of the first patients on whom I tried nitrous oxide and oxygen. She not only was willing to have this tried, but eager. The results were most gratifying. I have been able to do permanent work unhindered by any discomfort or suffering on her part, and a great saving of nervous energy on my own. This is but one case out of many.

Up to a few months ago this was the only really effective method I had ever used. In the early part of September Dr. J. Homer Wright, pathologist of the Massachusetts General Hospital, described to me very minutely a method of obtaining local anæsthesia, as used upon him very successfully the preceding summer by Dr. Ottessen, of Christiania, Norway. This method may be described briefly as follows: Distal to the tooth to be worked upon, the soft tissues are thoroughly cleansed and treated with a suitable antiseptic solution. About 2 mm. above the free margin of the gum a hole is then bored with a No. 3 Beutelrock root canal drill in the engine, through the periosteum of the bone, just entering the spongiosum. One-half to 1 c. c. of a two per cent. solution of novocaine (to which has been added a few drops of adrenalin) is then injected with a powerful hypodermic syringe, using moderate pressure. Immediately the cavity is ready to be worked upon. While this in my hands has not been

wholly devoid of failure, I believe these failures are due to the lack of fully mastering the technique. Using it several times daily, as I have for the last five months, the failures grow farther and farther apart as technical skill increases. It seems hardly necessary to say that the strictest surgical cleanliness be observed throughout. The nitrous oxide method must be somewhat limited in its use, while the Ottessen method is much wider in its scope. With children the injecting works almost to perfection, their soft, spongy bones and free circulation readily taking up the drug, while with them nitrous oxide, in my hands, is almost a complete failure. On the other hand, in cases of pericemental inflammation it would not seem safe to inject; likewise the slight inflammation of the pulp seems to render success very doubtful. Here oxygen and nitrous oxide can be used to the best advantage. Again, to the extreme neurasthenic type nitrous oxide is more applicable, relaxing the tension and deadening the disagreeable vibration of the burr, which, even though there be no pain, this type is hardly able to bear. To my mind it is possible to practice to-day with a comparatively small amount of pain. The attitude which the public assumes toward these methods convinces me beyond a doubt that it is only a question of time before they will demand that they receive at our hands the same consideration that they now receive from the physician and surgeon.

THE PRESIDENT'S ADDRESS TO THE MASSACHUSETTS DENTAL SOCIETY, MAY 11, 1911

BY CARL R. LINDSTRÖM, D.D.S., BOSTON, MASS.

At the last annual meeting some dissatisfaction was expressed by members because of lack of growth of the Society. I have tried to study the question to see if some reasons for this fact could be found.

In looking over the history of this Society we see that it has had its ups and downs since its organization in 1864. In the third and fourth years of its life there was considerable life and enthusiasm displayed by its members. Financially, it also shows up to better advantage, considering its then small membership and also taking into account the greater purchasing power of money of that time. For instance, it is recorded that in 1865 the members raised \$250 to entertain the members of the American Dental Association who met in Boston that year. The following year \$175 was appropriated for the purchase of a microscope. The Society was then holding monthly meetings and selecting a year's list of essayists, one for each month, something that would hardly be possible to do to-day.

For some time the Society flourished and made a place for itself in the professional and popular esteem. Then, it seems a spirit of rivalry sprang up and divided its members and that various changes in the membership and the quality of the meetings occurred. Its very life was in danger and this was so keenly realized, that Dr. Codman, in 1873, closed his address with the following words: "When a society's members and officers attend to the legitimate duties of a society devoted to dental science and to the education of its members socially and professionally, it progresses; but when the officers stand on close ethics and hold a tight rein over the private judgment of the duties of members toward the profession, or when members have private axes to grind, the society loses strength, its members give the cold shoulder, and its usefulness vanishes."

In 1888 the Society had a membership of 115, so it took about a quarter of a century to pass the 100 mark. However, the early struggles and troubles had their broadening effect. The habit of keeping the laboratory under lock and key had disappeared; a broader spirit had been introduced; men were no longer afraid of each other. This spirit grew so broad among individuals and societies alike, that in 1890 we find a number of the New England societies joining efforts in a large union meeting for a common good.

From 1889 to 1892 there was a decline in membership; from 1892 to 1894, there was a small gain of thirteen members, making a total of 127. So, for five years, it was practically at a standstill.

The condition was recognized and studied; a way was found to increase the usefulness of the Society; districts were organized, new business methods introduced and results followed immediately. In 1899, five years later, we find the membership had increased to 216. Thus, in ten years, the Society had accomplished what previously, it had taken twenty-five years to do.

The result of this more modern method of carrying on the work of the Society and thus enabling it to increase its usefulness, shows plainly that the need of that time had been met. For six years later, in 1905, the Society had increased in membership from 216 to 500, an increase in six years of more than 125 per cent. No such advance is registered in the following six years, only a little over 100 members having been added during that period and for the last three years, the Society has made practically no growth.

The question is, Has not the time now come, when new methods should be devised to increase the Society's usefulness? In the business world, it is a well recognized fact that, on an average of every ten years, there must be radical changes to meet new standards. If men in the business world refuse to adapt themselves to new conditions, they are soon "down and out." The progress of the world *waits* for no one.

To-day, the average member of this organization has no pride or interest in it. Hence, one of the first steps is the consideration of how to overcome this *inertia* of the average mem-

ber of the Society, as well as of the profession at large. The second step is, to rearrange the machinery of the Society, so as to adapt it to present-day conditions and needs, and to devise a way, whereby the members can really control it themselves. To have an interest in anything and to keep it you must be able to give of yourself to it.

The greatest need of this Society today, and which, if met, would prove the best investment the Society has ever made, is a paid secretary. Every organization needs one today, if it means to be active. It should be the business of such secretary, not only to keep proper records of all doings of the Society, but be its real business agent and a connecting link between all its activities; an official to represent the Society and work for its interest at all times, and to be the staying power whose duty it should be to meet with all committees and keep things going, when a tendency is shown to slacken down the pace. It should also be his business to study ways and means to increase the membership, so as to keep the different boards of censors busy, which I believe could be done if gone at in the right way.

There are many ways in which he could be useful. For instance, he could help to bring the Massachusetts Dental Society into touch with organizations in the State that are working in the interest of different humanitarian activities. The influence of our organization would then be felt more strongly where it ought to be felt. He could keep in touch with the dental schools and the State Board, to find out where the young graduates are located, and by personal call, or correspondence, he could get hold of them, and, if found to be of the right kind, induce them to join the Society.

He could soon acquire knowledge of the weak spots of our organization, that would be of great value to the Society. You cannot throw all this labor on any person without proper compensation. Pay a secretary well, then leave it to the President and Executive Committee to see that he does his duty.

The Society, for the next two or three years, should cease voting money to outside interests and should use its money to work up its own organization.

One policy should be adopted and adhered to, namely, that all business of the Society shall be transacted at stated times and not left to a late moment, just before adjournment, when perhaps not even a quorum is present and when the man with "an axe to grind" gets his work in and perhaps defeats the wishes of the majority of the members.

The Society should work for the greatest good of the greatest number of its members and a closer understanding of the principles that it stands for. Personal and selfish ambition, all spirit of revenge and our own personal desires should be subordinated to the good of all. I do not mean that anyone should sacrifice his principles or his sense of right and justice; but factional disputes should be discouraged, because they mean death. The welfare of the whole profession and the whole Society should be our aim and if that is the ruling spirit, there will be nothing but growth and prosperity and good-will among us.

CLOSER UNDERSTANDING BETWEEN THE PROFESSION AND THE DENTAL COLLEGES NEEDED.

The profession is suffering from the lack of training of the young graduates that are entering its ranks, not so much from a lack of technical training, as from a lack of the understanding of the broadest kind of professional ethics.

All education should lead to the fullest preparation for life, as any separation between culture and service leads to destruction. Froebel formulated his educational principles as follows: "From life, through life, to life; that is, from living experience, through living thought, to living deeds." There must be more time and attention given, in the curriculum, to the subject of dental ethics in its broadest sense. The students should be more thoroughly instructed in their social responsibilities to the community in which they are to earn their livelihood; also in the principles of fidelity to their chosen profession. They should be taught that their first duty is to join the State society where they are located, because by so doing they will be taking the first steps toward making a return to the profession and to the dental societies, for those advantages which have resulted from the knowl-

edge gained by the self-sacrificing labor of the profession as a whole. If the students and young practitioners refuse to co-operate they become simply parasites, living from the labor of others.

They should also be instructed in the right and true relation between compensation and services rendered. We also should demand, that the professors and teachers of the dental schools, be active members of our State societies. It is almost impossible to find a *medical* teacher who is not a member of his own State society.

THE DENTAL LAW.

At the last meeting, just before adjournment, a committee was elected to try to secure such legislation as should limit reappointments on the Board of Dental Examiners to a fixed number of years. The committee thought it wise to try to improve the existing dental law at the same time. A bill was filed with the Legislature and a date set for a hearing. The committee found, however, that there was considerable opposition among many of our own men against this proposed new law. The new law had many good points, as well as some points that were not sufficiently worked out. I will not undertake to comment on the entire law, but will take a few sections.

First. Section 3 limits the power of the Governor to the appointment of only such men as the Massachusetts Dental Society shall suggest. Any dental law must be based upon the police power of the State, in the interest of the people, and supported by the taxes of the people of the State. Is it not a fair question to ask then, if it is the part of wisdom, to order that a few men of the Massachusetts Dental Society should determine who shall be appointed, or who shall not be appointed? The only possible ground for such *special* legislation, is based upon the supposition that these men give expert advice. If we could be sure that it would always be expert advice, it might be favored; but what guarantee would the public have that even it would be free from the politics of our Society? Then, too, why should we deprive the other 2,000 dentists, more or less, in the State, from making their influ-

ence felt? I believe that all practitioners of standing should be members of this Society, but the fact remains that they are not. Moreover, why should we ignore the rights of all other dental societies in the State, as well as those of these excluded individual dentists?

Second. Section 8 calls for an increase in the period of preliminary education. This is just and wise, so long as an individual is granted freedom to receive this education wherever seems fit to him. The latter part of this same section demands that all applicants must be graduates of a dental college. At first thought this sounds very well, but on second thought I feel that it is not so wise, and for the following reasons:

1. There is, a great difference in our dental schools. Some exist primarily as money-making institutions. There education is secondary; I believe that this kind of school would benefit by such a law, while those institutions standing for something better would not gain by it.

2. I do not believe it is the business of the State to dictate where a man shall obtain knowledge; but it is the State's business to see that a man has the knowledge; and I always have thought that the State Board existed just for that reason, namely, to pass upon the knowledge, intelligence and character of an applicant. If you cannot trust the judgment and intelligence of a State Board, why should you have one at all?

I have listened to the arguments of the committee for and against this requirement, but have not heard any argument that rationally proves it to be necessary or that shows it would be a greater benefit to the public. Those who claim that it is impossible to receive an education in any other way than at a college, consider that anyone who thinks otherwise, is ignorant and is not a believer in education. Of course all such talk is foolish and needs no answer. History teaches that many of the greatest men in the various activities of life were self-taught while engaged in manual labor. It is very evident that it was largely due to their environment and their physical training, that they acquired eminence in their professions.

I think that such an amendment to the law, would not aid us in the slightest degree to get rid of the big advertising quacks, who do far more harm than a number of smaller men and, as a rule, can not only display degrees from dental colleges, but from medical schools and other institutions of much learning. That a man has a dental degree, is no guarantee that he will not be a quack or a dishonest practitioner.

I think we must take the broadest and, as I believe, the most unselfish view of the matter. We claim we want these particular changes in the law for the good of the Commonwealth, to protect the public and for the dignity of our profession. Now let us see if it really is so.

You and I know the history of the present law. We know why it was brought about and I wonder if the good of the public is the real motive for the desire for a change now. For the last few years there has been a campaign of oral hygiene going on all through the State. The wage earner has come to realize that he and his children need care of their teeth. Persons of small means, are demanding it for the health and the welfare of their families and the very poor are asking for it. Do not think me impertinent if I call your attention to the fact, that in the State of Massachusetts there are not enough dentists to care for all persons who need our services, if we worked every hour of the day. Why then, should you and I try to put a greater limit on the output of dentists than is necessary? By so doing shall we not increase the misery and suffering of our fellow citizens, under the pretence of education?

Third. Section 16 relates to the revoking of the license of any practitioner for unprofessional conduct. This would be a good thing if a definition of professional conduct had previously been supplied.

Fourth. Section 18 practically takes away the practitioner's right to appeal to the court if his license has been revoked, in case the Board has erred in judgment; but it offers as a substitute an appeal to the Governor and Attorney-General. I think we all would much rather trust our lives and property in the hands of the court. We would feel much safer. For when you take away a man's means of earning a

living, you strike at the life, not only of himself, but of those dependent upon him.

A new dental law that to-day ignores or makes no provision for the dental nurse is not in accord with the spirit and the needs of the time. A year ago the American Academy of Dental Science and the Metropolitan District of Medical Sciences placed themselves on record as wishing to have the dental law of the State so amended, that it would allow for the dental nurse. Other States have since taken the matter up for consideration. Three years of personal experience at a dental dispensary for the poor, has thoroughly convinced me that the dental nurse will be a great factor in helping to solve one of the greatest problems of prevention of disease and decay of the teeth among the more unfortunate classes, whom we are to-day trying to help and to educate in oral hygiene. We know a better knowledge of this kind of practical science would, to a great extent, reduce disease and suffering having a dental origin, as well as help prevent the spread of many other diseases.

It is our duty, as an organization, to take a broader and more humanitarian view, rather than the more selfish "plumbers' union" view.

At present, the dental law that is supposed to exist for the public good forbids this line of usefulness in dental dispensaries. I believe that the average practitioner, as well as his patients, would be greatly benefited if he could have the use of a well-trained dental nurse. He would then be able to serve the public far better. It is understood that there must be, of course, regulations guarded by properly worked out amendments to the law. I believe the average dentist would support and agree to such a law, if he were convinced that it could be properly safeguarded in the interest of the public, as well as of himself.

DENTAL DISPENSARIES.

There is an increase of activity in dispensary work throughout the State. Efforts in behalf of the school children are being made in many places in connection with the public schools and many requests for assistance have come.

which show an increased realization of our responsibility in the social service that we, as a profession, owe to the State.

You have all received the booklet with plans of the proposed Forsyth Dental Infirmary that is to be located in the Fenway District of Boston. This will be established through the generosity of the Forsyth family, who deserve much praise and gratitude for their philanthropy. It promises to be the largest institution of its kind in the country, if not in the world, and those who have given their time and labor in working out the plans for this undertaking, deserve much credit and appreciation. I believe, however, that it would have been of greater interest to the dental profession of the State, if it had been left to them alone to work out this great problem, instead of its having been left to the direction of both the medical and dental school influences, however good they may be. Dentists then, would have left a greater pride and responded with greater enthusiasm and more generous co-operation. The dental work as outlined in the original plan is to be done by students. Though this may be ever so good of its kind, I do not believe that the skilled labor of the profession will co-operate as freely under this order of things, since one of the greatest of incentives is lacking, namely, the honor that an appointment to an institution of this kind would confer. The welfare of the children themselves should have been the first consideration and certainly the children, treated by students, will suffer for the lack of greater experience and skill that they can bring to it. It will be through the dental profession itself, that this problem of the care of the teeth of the children of the State will have to be solved, just as it belongs to the medical profession to solve their many great problems. I think it would be an honor and a duty of the Massachusetts Dental Society to take up this big problem of settling how the teeth of the poor may best be cared for. I think it would be a means of growth for the whole society if it levied even a small assessment on each member, the sum to become the nucleus of a fund for this purpose, and if it had at least two working committees to deal with this whole subject of prevention. Here is a great opportunity for the Massachusetts Dental Society; will it take it or let it pass?

WHAT DENTISTS HAVE DONE FOR OTHER PROFESSIONS*

By Bernard J. Cigrand, M.D., D.D.S.,

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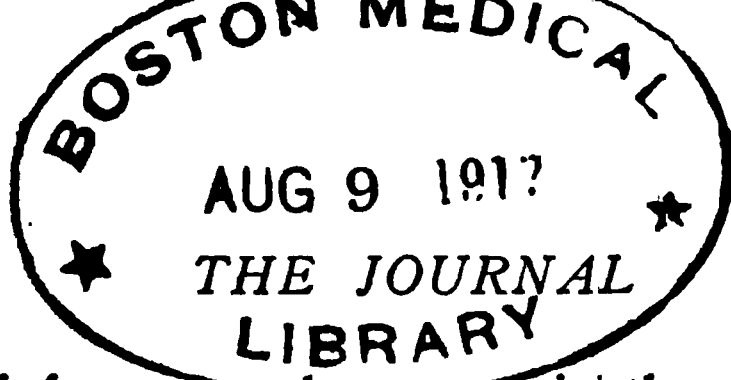
Lecture illustrated with 175 slides.

This lecture is on the subject of what dentists have done for the world, and we are going to forget and eliminate any reference to dentistry, because those of my audience who are dentists get enough of it in their offices, and those who are visitors get enough of it in the chair. There have been many students of the dental profession who have designated our calling narrow, and that its practise does not inspire broadness; and in reply I will say that such an opinion cannot be entertained by any practitioner if he is conversant with the general labors and special accomplishments of men of our profession. The profession is entirely too little informed concerning the contributions which dentists have rendered the world. It is to be regretted that too few of the profession have endeavored to become acquainted with the achievements of dental practitioners.

And now, introductory to the lecture proper, permit me to direct your attention to a number of rare pictures which I have discovered in my historical researches; they will indicate that the statement so frequently seen and heard that dentistry has never attracted artists to blazon on the canvas nor sculptors to carve into stone the emblems of our profession is an injustice to both artist and our profession.

We now travel in our mental journey to New York, there board an ocean greyhound, and after a few days of peaceful rocking, glide into the harbors of Europe. At Rome we are shown in the old cathedral, the painted reproduction of the St. Apollonia, the goddess or patron saint of dentistry. You will observe in one hand a palm, emblematic of peace or indicating freedom from pain. In the right hand she is holding what some have described as a candle, but history tells us that it is an anciently

* Read before the Mass. Dental Society, May, 1911.



formed pair of forceps and grasped in them is a molar tooth. The great field of work to be covered in the lecture permits only a brief sketch of these introductory pictures. The oil painting entitled "The Dentist" I copied with camera, at the Dresden art gallery, and assure you it is far easier to tell about it than to get permission to make the reproduction. This picture in oils is a splendid bit of art and painted by the celebrated Dou, who distinguished himself by devoting his entire life to reproducing the daily life of people and in this connection he made this painting. It represents the old and early practice of the dentist in his migratory course from village to village, in his career as the embryonic professional gentleman. A distinguished art critic says of this painting: "The dentist, with pompous air and satisfied expression, holds up as a trophy the tooth, just extracted, while his victim, a distressed-looking boy, well displays the feeling of one obliged to go through such an operation. It illustrated the evolution of not only dentistry, but art as well, and is valuable as portraying the manner of dress of the early practitioner."

There is another very rare picture in Rome. In days of old when a dignitary was suffering from pain in the oral cavity and relief could be found in no way, they had a monk come in and pray to the goddess Apollonia for the relief of the pain, and this picture illustrates such an occurrence; or they would hire the monk to go in retirement and pray for relief—no doubt if the prayers were repeated often enough the pain would subside.

A rare picture which adorns the historic art gallery of Dresden is the one entitled "The Tavern Clinic," and it suggests the possibility of it being the first or origin of this popular and ocular demonstration. It is the work of the eminent painter, G. Honthorst, who enjoyed the reputation of being the favorite court artist of Charles I. of England. His subjects usually represent jolly parties, such as actor, roving troupes and prandial board scenes. This picture is famous because of the rarity of the illumination features, as he was among the most capable artists when it came to illustrating light and flame reproductions. In this picture, pronounced one of his very best, the candle light is very perfect, and its reflections upon the other faces and general expressions of all present is notable for its exactness. The *Encyclopedia Britannica* comments on his work as being equal to that of

Caravaggio in the art of reproducing the effect of a single candle. At considerable cost to myself, I have had all these pictures which I photographed, tinted in their natural colors and hence you see these, as well as all the pictures of this lecture, in a natural and artistic atmosphere.

To Munich we next travel, where we enter one of the finest and most famed art galleries of the world. Here I discovered a reproduction of the long sought "The Martyrdom of Apollonia," which so interested the researchers, Dr. W. C. Barrett and Dr. Jonathan Taft, but not until this evening have we as dentists gazed on this remarkable picture. It has often been said by not only members of the dental profession, but the medical as well, that there are no allegorical paintings or pictures of dentistry; this picture refutes the statement, since this historical allegorical painting, by Jacob Jordens, was conceived with this phase of art in view. I have also a picture of the great artist who thus remembered our goddess. The "Court Dentist" portrays the gradual rise in the position of the practitioner in modern times, but also indicates the dreaded approach of the man with the cold steel. In the picture "Questionable Confidence" we have a very delicate representation of the dentist examining the oral cavity. Hidden away in this right hand we see the old-fashioned turnkey and while the patient manifests by the appearance of the face every possible confidence, her holding the operator's wrist with her right hand betrays the fact that the confidence is not without doubt. In the Berlin art gallery we have "In the Dental Reception Room."

From the art galleries of Germany we now speed to Paris, there to begin the real mission of our tour, namely, that of illustrating what dentists have contributed to other callings. Here, in the gay yet scientific and artistic city of France, we are led to the old college of St. Come, where are still to be seen the various ancient and modern methods of surgical procedure. We are shown the instruments once used by the distinguished dental surgeon, Ambrose Paré, whose labors in general surgery have attracted the world to his accomplishments. Prior to his day the surgeons adopted various methods to stop the bleeding of vessels. The cruel practice of searing the lacerated parts with red-hot irons or styptic liquids was the one quite generally in vogue,

though the inserting of pine and hickory sticks into the arteries or veins was also deemed proper practice. Not until the dentist, Ambrose Paré, became interested in the problem did humanity receive its first form of anesthetic, in that he discovered and donated to general surgery, the invention of ligating the artery with cords or string. He had seen the terrible horrors on the battlefields, where he served in the capacity of staff surgeon, and the indescribable tortures which the injured soldiers endured awoke in Paré the ambition to prevent such sufferings. His new method of painlessly binding the arteries and saving lives, astonished the world and by this great contribution to general surgery made major operations bearable, and the saving of human lives possible. To Ambrose Paré, the general surgeon owes untold debts of gratitude, not alone for the invention of the ligature, but for countless other instruments employed to this day in surgical procedures and for his treatment of gunshot wounds, showing that they were not burns, demonstrating his province by firing shots into bags and packages of powder without causing flames. The swan's-beak forceps, for dilating wounds, so essential in to-day's surgery, came from the inventive mind of the dental surgeon Ambrose Paré, of Paris. He was also a student of the heavens and his diagrams of the comet of his day was recently published in the world's press.

The French capital we leave and travel to London, where we immediately come in touch with the great work of John Hunter, whose deep interest in humanity in general led him to spend more than \$360,000 on his famous collections of comparative anatomy. This same great assortment of animal specimens forms the basis of the world-famed Museum of Royal College of Surgeons of London. If there are any dentists of this day, who feel they have contributed liberally to the world's collections, it might be well for them to contemplate the enormous expenditure of Hunter before venturing a boast of their donations. Two hundred and fifty thousand dollars in those days was an enormous amount of money. Aside from this great contribution it must not be forgotten that Hunter was one of the most profoundly informed men of his time and added considerably to the knowledge of this basic study of man. He was the surgeon-general of the British forces in 1790 and his contribu-

tions to the healing arts place him in the first rank of English scientists of his time. But not since the days of Aristotle, has there lived a man who did so much research in the animal kingdom as was done by John Hunter and his unselfish interest in anatomical discoveries is well expressed in his splendid museum, with its thousands of valuable specimens which was bequeathed to the public. While visiting this grand exposition of comparative anatomy, it afforded me untold pleasure to reflect that it was a dental surgeon who had contributed thus handsomely to the world's storehouse of knowledge and I went to his grave to pay my humble respects to so brilliant and broad-minded a scholar. While in his lifetime but little honor or renown was accorded him, after he was dead and buried the world finally recognized his work. There is another Englishman of whom I will speak before we leave that historic island. It would please me to refer to many other Englishmen, but the time will not permit me to include all in this first lecture on the subject.

I am impelled, however, to include in the group the well known and much beloved Dr. J. Leon Williams, who recently was a guest in America. This talented dentist, now living in London, has contributed considerably to the world's affairs. His work entitled "The Haunts and Home of Shakespeare" is a classical production. More than twelve thousand copies at \$12 a volume have been sold, which certainly is a high compliment to his genius. He has also studied the art and science of photography, gets superb results with the lens and his work in this particular field are seen in the art galleries of the world. His studies of "Irving's Sleepy Hollow" deserve especial comment. This work, published by Putnam & Sons, was issued in a magnificent holiday edition and has attracted considerable attention on both sides of the sea. The historical volume entitled "Sicily, Land of the Departed Gods," is an interesting book relating to unpublished romances of this beautiful spot and illustrated by Dr. Williams' own artistic productions, and has found its way into the choicest libraries of the world. His writings first attracted my attention in 1895, when I read a most fascinating illustrated story in the *Cosmopolitan Magazine*. It was entitled "A Christmas Legend of King Arthur's Country." He gave new life to the old falling and decaying castles in the valley

of Somerset, England. I was charmed by his language and was impressed with his story. He wove a splendid legend and made one feel that he lived in the days of the heraldic King Arthur. The pictures which embellished the pages were the suggestion and product of his artistic mind. It afforded me great comfort to know that one of my own profession was the author of these highly prized sketches. While Dr. Williams was in Naples he took up the study of art under learned artists and mastered the elementary phases to a point where he was recognized as possessing high art talent, as was evidenced by his having painted from nature a picture which was sold for one thousand dollars.

Now let us take the ocean greyhound and while on the bosom of the Atlantic, let us telescope time and make it possible for us when we land in old Boston, to write the date of 1770.

The harbor of Boston is reached and the Continental people are gathered before the State House discussing the tax inflictions and other grievances of the colonies against England. The mother country has sent more soldiers to intimidate the Americans and in the first conflict of arms, in 1770, known to history as the Boston Massacre, we find that a dentist was among those who was fatally shot. He was a lad in the office of the Greenwoods and he was one of the first to resist British interference in strictly colonial affairs. Hence, to the glory of our vocation belongs the credit of having at the earliest outbreak of the revolution, a representative in the ranks of the mob which gave the English soldiers the initial demonstration of American patriotism. The young dentist who lost his life in this heroic skirmish was Mr. Samuel Maverick, and he deserves our gratitude and respect.

Five years later we again find a congregation of patriots eagerly discussing the approaching fray with the mother country. In the midst of these earnest and defiant men we see a heavy set, sturdy and enthusiastic gentleman. It is Paul Revere, a dentist, and he is doing all within his power—and he is a man of much influence in Boston—to arouse the sentiments of the Continentals to strike in defense of their rights and be prepared to offer physical resistance to the tyranny of England. He is indeed one of the leading spirits and his advice is heeded, since he is known to be of a courageous character. On April 18, we see him arranging with other patriots to be the sentinel who is

to awaken the citizens and farmers as to the exact movements of the British. His hazardous midnight ride, with which you are all familiar, the Poet Longfellow has blazoned on the pages of literature with rhythmic lines:

“Listen, my children, and you shall hear
Of the midnight ride of Paul Revere.”

Certainly it was an important dash which this dentist made and the history which follows in the wake of his galloping horse, has not yet been fully written and for generations to come, will be heralded to the rising youth as one of the dramatic and spectacular events of our nation's morning time. Not only did he arouse the neighbors on the way to Lexington, where the ammunition and the arms of the colonists were stored and which he was sent to protect, but he also, with all speed, dust covered, exhausted, halted his horse at the side street of Lexington, where, in a small frame house, Hancock and Adams were in hiding. He awakened them and made their safe escape possible. Without this warning the patriot cause might have been nipped in the bud, for had these two gentlemen, the soul and the spirit of the revolution, been captured, our war for freedom might have been postponed for years, with the possibility of never having come. It afforded me greatest delight to tramp over these scenes, saunter about the old skirmish lines, loaf about the historic stream, and drink in the sweet patriotic sentiments everywhere embossed upon the stones, the bronzes and the wood. It was a truly serene pleasure to contemplate that the “shot which was heard around the world” was made possible because of the daring patriotism of a dentist, Paul Revere. His old homestead is being cared for by patriotic societies, and in it you may view many ingenious things, which have come from the dextrous hand of this early craftsman of our calling. Among these tokens, we see beautiful silver vases, handsomely engraved silver and metallic dinner sets and a great variety of carvings, all of which clearly indicate his dexterity and love of the manual. Besides being a practising prosthetic dentist, carving and fashioning artificial dentures, he was also an engraver of Colonial fame. He was called upon to do much of the illustrating of the New England States and designed many artistic pictures. His rude sketch of the Boston

Massacre is the foundation of the present-time handsome oil paintings we see in our halls of patriotism.. But some of the best work of his hands was not alone engravings. He was an expert at founding bells and throughout the States to-day you may hear the peals of bells, whose tones were the implantation of Paul Revere. At the battle of Bunker Hill one of the first to lay down his life was Dr. Joseph Warren, a physician, and real leader of the rebellionists. When the battle was over the dead were hastily buried, and some time after, when Massachusetts wished to more definitely remember Warren, the remains were dug up, and considerable difficulty arose as to the identification of the body. Several of the dead seemed to answer to his description. Matters grew unpleasant, as the population had criticised the authorities for waiting as long as they did before showing consideration of this distinguished patriot. In the midst of these discussions, Paul Revere intimated that he might be able to identify Dr. Warren's body, and he, with the committee, departed for Bunker Hill, where Revere, after a careful examination, pointed out the body of Warren. He was able to identify him because of an artificial dental appliance he had constructed for the doctor. Dr. Warren's physician and friend also corroborated the testimony of Revere, in that he recognized the obliquely broken natural front tooth. Hence, through dental identification of the dentist, Revere, the real grave of a patriot was established. But the descendant of the Huguenots, Revere, has contributed another memorable thing which must be mentioned. When the question of the adoption of the Federal Constitution was before Massachusetts, there were grave doubts as to that commonwealth accepting this document as the basic law. For days it seemed that the legislative body which had the problem in hand, would vote to reject the instrument. Samuel Adams, the giant in debate and the power in the law, cast his vote with the opposition and as it required but a few changed votes to carry the measure, Revere called on Adams and so thoroughly impressed him with the merits of the proposed Constitution, that the sturdy orator took the floor and advocated the adoption of the Federal Constitution. Hence, this to the credit of the dentist, Paul Revere, for having turned an entire and influential community from the anti-Federal to the loyal Constitutional party.

The picture now on the screen shows the portrait of Dentist Paul Revere, and I am not showing this without proof. As early as 1892, eighteen years ago, I delivered a lecture on this subject of Revere's dental knowledge, have looked up the matter in the Chicago Public Library and historical collections of Boston and have found over seven hundred references which distinctly state that he made his livelihood by practising dentistry, and was a bell founder and engraver incidentally. This being so, we should indeed be proud of that great personality.

Even at the battle of Bunker Hill there were many dentists, but prominent among them the Greenwood people. John Greenwood was an expert carver of dental substitutes and when the revolution broke forth, the necessity for fifes and other military instruments became imperative and he applied himself and furnished these needed instruments. The fifer, John Greenwood, Jr., and the fife manufacturer, the father, contributed considerably to the War of Independence. In fact, one of the historians, Lossing, tells us that this martial music did much toward keeping up the spirit and made the ragged Continentals forget their appearance. Young Greenwood not only played at the battle of Bunker Hill, but he lent inspiration to the revolutionists under General Putnam and General Benedict Arnold and was promoted fife major. He served several years and was in that capacity at the battle of Trenton, where he displayed his musical and heroic qualities. We are still in Boston and will now take carriages to the old Longfellow home, where Dr. N. Cooly Keep, dentist, distinguished himself as being the safest professional in the learned city in the administration of anesthetics. He was selected to give the ether, which he helped to discover, to Mrs. Longfellow during confinement. This was the first instance in history of this anesthetic being administered in obstetrical cases, and this credit belongs to the dentist, N. Cooly Keep. His name is also connected with what has been pronounced the most remarkable case of circumstantial evidence ever brought before an American jury. The terrible and surprising disappearance of Dr. Francis Parkman and the arrest of Prof. John W. Webster, of the Harvard University, aroused the entire country. The trial lasted many weeks and the most learned attorneys of New England were engaged in this remarkable trial. The murderer had

practically destroyed by fire every possible proof of identity, the few remaining elements of the osseous tissue causing the experts of anatomy to tussle, to quarrel, to wrangle and deny every item which seemed to lead to identification. But a mere trifle left unsolved—the victim's artificial teeth—were still partially in assemblage, and his dentist was Dr. N. Cooly Keep, who after some days of examination was ready to take the stand. For eleven days the attorneys had waged unrelenting war upon the witnesses and upwards of one hundred direct witnesses were heard. All, however, were of a circumstantial nature, and not until they heard from the dentist was there anything of a definite and direct character. When he took the stand he made the most convincing and the most emphatic sentence ever given in so notable a murder trial. What he said brushed away all the suppositions of the days gone before. What he testified lent strength to the truth, and his reply to the question, "What exhibit have you in your hand?" sent dismay to defense and accused. He said: "These are the teeth of Dr. Francis Parkman." A lull fell upon the court; a real witness had been found whose testimony it would be impossible to break down and from the hitherto bold and defiant murderer came the confession that he killed the millionaire and that Dr. Keep's testimony was correct. This is considered in criminal annals as one of the most convincing and remarkable identifications. It gave dental identification a recognized place in court proceedings.

Into the busy streets of Boston we now return and find the dental office of one little known to dental eminence, yet in literary circles he was considered distinguished. Strange indeed that we of his profession are so little acquainted with his profound learning. This man whose office we visit, has gone to his reward and he was the eminent scholar and authority on Italian literature, Dr. Thomas William Parsons. It has afforded me greatest pleasure to read the writings of this broad-minded gentleman and dentist. Thomas Bailey Aldrich, in the *Century Magazine*, July, 1894, wrote a lengthy and appreciative article on Dr. Parsons, which is well worth reading. Does it not lend comfort to us to know that a man of such learning was a dentist? Does it not make our hearts beat quicker to find that one of such great learning would remain true to our vocation? Indeed, it inspires

us all to feel the ennobling influence of these good and great men. They did great things for humanity; they pointed out new paths and brought new flowers to our tables and furnished new prayers for us all. Let us remember them; let us revere and make known their contribution—this will not detract from our own, will harm no one who loves his profession and will certainly make our own membership, as well as the listening visitor and outside readers, respect our calling all the more. It puts light into the statement that we claim sturdy men in the ranks of our profession and proper regard for their accomplishments will only reflect credit upon ourselves. There were men who served their country on land and on sea when she was in the turmoil of war.

Ere we leave Boston let us reflect on the patriotic career of Josiah Flagg, who volunteering as a soldier of the War of 1812, was captured and taken to England, where he, by his knowledge of general surgery, attracted the attention of Sir Astley Cooper, who, when Flagg was on parole, had him assist him in the great clinics of the London Hospital. The distinguished Englishman was so impressed with the dexterity of Flagg and was so pleased with his progress in the art of surgery, that he requested a painting of him and directed one of London's artists to produce it. This was indeed a high compliment, since a man of Cooper's eminence would not have ordered such attention if our dental practitioner had not merited the compliment.

Our imaginary train speeds on and stops at Hartford, Connecticut, there to visit the haunts of the distinguished Horace Wells, whose contribution to humanity is possibly the most important ever given by any person of the present or the past. This mild-appearing dentist gave a balm to the world which neither tongue nor pen can fully portray. He was, as you all know, the discoverer of prolonged anesthesia as employed surgically. It is gratifying to learn that the world at large has thus recognized his discovery. You will find a beautiful bust of him in the Army and Navy Museum at Washington, you will see and hear of the unveiling of a handsome statue of him in Paris and now, as we stand before his monument in the historic city of Hartford, let us remember that his was indeed a superlative contribution to the comforts of suffering humanity. When I stood before that monument and reflected what I had seen in the College of St. Come,

Paris, where are still the hitching posts where suffering patients were tied while the surgeon labored, disturbed by the crying, screaming and torture-toned yells of the sufferers and when they there showed me the so-called wooden beds and racks upon which patients were fastened while undergoing indescribable pains in the surgical treatment of injuries, then as I stood before his monument, I seemed in a dream, unable to comprehend the sweet sleep, which the great—gloriously great—Wells had bequeathed to suffering humanity. Here under his spell they might smile, they might laugh and they might dream while the surgeon prowled around in their vitals in search of physical disturbances. The surgeon could plow his knife through the sensitive muscle and use his chisel or employ his saw, all has lost its effect—the sufferer is asleep, in reminiscence playing among the fragrant flowers of the lea—unconcerned in the disturbed and excited condition of the surgeon. While we stand before this statue and monument let me bring to your attention the kindness of Dr. Charles McManus, through whose generous consideration we are able to look upon this beautiful picture, in remembrance of him, as well as his venerable father, who has done much to embalm into history the memory of Horace Wells. I frankly acknowledge my gratitude for their years of encouragement and kindly appreciation.

Recently a beautiful monument was dedicated in his honor at Paris and the admiring professional friends and civic authorities showered bouquets upon the monument. How sad that some of these tokens could not have been accorded him when he was alive. The price of one of these tributes would have meant much at times when he had neither bread nor comfort at his home. He merits our highest esteem, he deserves our highest admiration—he was truly a benefactor of humanity. While he lived he was ignored and ridiculed, but now that he is dead we place flowers upon his grave. Let this teach us to bestow more flowers and more frequent bouquets while there is still a possibility of appreciation by the living of our recognition of their worth.

And now with speed let us depart for Syracuse, New York, where Dr. Amos Westcott once was the Mayor of this center of learning. He contributed considerably to general inventions, though his rotary churn is possibly the most noteworthy, since

he was among the first to demonstrate that by rapid rotation the milk and the cream would separate. The introduction of that most valuable element in prosthesis and surgery, plaster of Paris, is accredited to him. Dr. Westcott was a profound student of botany and mineralogy and his finds and classifications in this direction led the Rensselaer Polytechnic Institute, of Troy, New York, to confer upon him the honorary degree of Bachelor of Natural Sciences, an unusual recognition from a high-class school of science. His success in the fields of science led him to receive highest offers to teach in the universities of America, but his love of the profession induced him to remain in general practise. Possibly his greatest fame rests in the fact that his son, whom he thought a poor success as a laboratory assistant, drifted into the world and wrote the most popular novel of this generation, "David Harum," which has found its way into dramatic and other forms of entertainment and instruction.

The broad literary career and artistic life of Dr. John R. Spooner we must not forget, since his engravings of Shakespearean literature are pronounced among the finest in existence. It was this dentist who restored the famous Boydell pictures of the themes of Shakespeare and this has made him famous in literature, though he is practically unknown by his own profession. He published the well-known books, "Biographical and Critical Dictionary of Painters and Sculptors," a volume of 1,200 pages, and recognized as the best and most reliable work on that subject. His work entitled "Anecdotes of Painters, Engravers, Sculptors, Architects and Curiosities of Art" ranks high as a reference work on this variety of subjects. He also published a new testament and had the most talented men of Italy paint the pictures, which he assisted to execute in copper and steel plates. This work is very rare and commands a high price and is valued as among the best illustrated Bibles in the English language.

We bid adieu to New York and we cut across the historic grounds of New Jersey and reach the city of Philadelphia, where the first person to be considered is the gallant Frenchman, Joseph Le Maire, who came to this country with Count Rochambeau, in the hope of being of service to the colonial cause. He was a well educated Frenchman and completed his medical studies in Paris, and his surgical skill was of invaluable aid in the surgeons'

department of the American Revolution. But his greatest contribution was the transplanting and implanting of teeth. While Hunter receives the credit for this operation, it was Le Maire who actually proved its principle; after hundreds of failures had been encountered he finally succeeded. Hunter wrote of the process and thought it might be successfully performed, but it took the eager, enthusiastic Frenchman to bring fruit to the theory. Out of this discovery has grown the great medical process of engrafting. Upon the find of Le Maire is based the physiological principle of foreign cell association, or the assembling of cells from different persons. This is one of the greatest contributions to modern surgery and the restoration of features, hands and extremities, through the application of the Le Maire discovery, are too numerous to even mention. Le Maire should be remembered for the services he lent his country during a period which was anything but promising. It will be news to many that this same dentist, as early as 1822, published a work on general pathology, showing his advanced knowledge of this phase of medical study. He was a studious dental surgeon and a prolific writer.

We next come in touch with a distinguished character in American history, Charles Wilson Peale, of Philadelphia. His fame rests assured, as he was the first to paint the picture of Washington, when that young Virginian was colonel in the British army. He not only pictured Washington once, but had seven additional sittings of this beloved American. The famous Peale Washington has attracted the attention of the world, and few people know how it came that the artist was able to restore the edentulous mouth, and thus reproduce the face of Washington. Peale's son, however, informs us that his father, who was a dentist, carved a set of teeth for Washington and during sittings, he had the great commander wear this artificial substitute and by this means he was able to bring youth and better expression to the face of the man who had suffered the loss of his teeth. Peale restored character to the face and gave us a natural Washington. Of course, the teeth which Peale made had no direct professional value, since he only had Washington wear them during sittings and this is the only reason why I mention teeth in this connection, as they served the purpose of the art side of

Peale's career. Dentist Peale, not only has given his generation eight original pictures of Washington and scores of copies, but he has made it possible for Americans of all times to behold the likeness of Lafayette, Randolph, Thomson, Pitt, Francis Key and other distinguished citizens of our country. The unique pictures of himself and large family I show to illustrate his talent and his home companions. Peale produced the first mezzotint made in America. It was he who discovered the mastodon in Virginia, and expended over \$5,000 to deliver it in Philadelphia, where it became the beginning of the famous Peale Natural History Museum, which then was a gigantic undertaking of its kind. It contained two hundred prepared specimens of animals, one thousand birds and four thousand butterflies. He, like Ottolengui, enjoyed the beautiful and varied forms of the butterfly. The museum also contained thousands of insects and many thousands of fishes and exhibits of water life. This dentist also founded the Philadelphia Academy of Fine Arts and he and his son Rembrandt, furnished upwards of one hundred original paintings. He was a student of nature and published many works pertaining to art and architecture and his writings on the care of the teeth, as well as his contributions to other scientific fields, illustrates his broad and liberal disposition. The invention of plaster of paris, when mixed with lime, sand and marble dust, employed to restore incomplete statues, is to this day the formula of Charles Wilson Peale. It was this same talented and cultured dentist who gave to the world the incorporation of platinum in porcelain work and this contribution to present art work in porcelain shading, as well as in dental progress, has deserved greater consideration. It is a strange coincidence that this man should be so deeply interested in the life of Washington, and that his death should have occurred on the birthday of the great general. Peale died on February 22, 1827, and the dental profession has every reason to be proud of this distinguished and capable American.

Closer to modern times we come and must not overlook our beloved genius, Dr. William G. A. Bonwill, who was a writer of considerable note. The poems which he published, as well as the unpublished ones, deserve comment. It is claimed by his family that there are still scores of these products unpublished

and it would indeed be interesting to see these mental creations. The inventions which he gave to the world were many and all bordered on the principle of making life easier. While I am not inclined to give much value to the influence of spiritualism, one must regard the subject as not altogether unreasonable when we learn of the deep faith this dentist had in that subject. Like Atkinson, he was a firm believer in this mysterious power of the departed. It is not for me to say a word against this theme. I am still from the southwest corner of Missouri. I want to be "shown" and am liberal enough to accord the so-called occult influences some attention. Bonwill personally told me that he had indisputable proof of the communication of the departed. And he wrote these lines to a friend: "I believe in inspiration. I never invented a thing or discovered a thing that were not revealed to me by the angels which came to me usually while I was asleep." We hear much just now of rapid breathing anesthesia, but does it occur to you that Bonwill as early as 1875, thirty-five years ago, read a paper on this discovery before the Franklin Institute of Philadelphia? Whenever you see a self-binder feeding its way through a wheat field, please do not forget that it was Bonwill who contributed to that great labor-saving device and that the present machine might not have taken its present turn nor artistically bound the bundle but for Bonwill. Nor should you look upon one of the modern skyscraping buildings, with its massive skeleton of steel, without remembering our dear and departed Bonwill, for it was his automatic and pneumatic mallet which became the basis of this great invention. The present riveting mallet, which ties and binds these steel girders and metallic braces together, is a direct copy of the Bonwill instrument and at considerable difficulty have the patent attorneys made it possible for the modern building device to do its work. In a few years we possibly will be erecting monuments to him, upon which we will shower bouquets, but too few cared to listen to him when he was living. This great Dr. Bonwill did more for mechanical progress in dentistry than any other five men in the profession. He did much to save our labor, he did much to relieve suffering humanity, and gave so many things, not to dentistry alone, but to many other useful arts. Dr. Bonwill contributed liberally to the world's advance, and

his unselfish consideration of others is manifested in countless improvements which have aided humanity in general. There are others in Philadelphia who deserve consideration—Dr. Kirk, who has given considerable attention to literature other than pertains to dentistry and his scientific contributions to chemistry, have attracted the attention of scholars everywhere. He was for some time the recognized leader of new thought in chemistry in the Towne Scientific School of the University of Pennsylvania. His researches in this field of study merited him the highest esteem of profound thinkers in this exact science. To many it was a regret that Professor Kirk took up the study of dentistry, since they deem him of greatest possible service to humanity in the study and research of chemistry. The deductions along biological lines have equally demonstrated his capacity to fathom the intricate depths of the mysteries of nature. Time will not permit me to longer dwell on the eminent in Philadelphia, but allow me to direct your attention to Drs. Garretson and Guilford, both of whom have done praiseworthy work in fields other than dentistry. Some future time I may describe their contributions, which have been most commendable.

Our face is turned to the city of Baltimore, which has always held for dentists a spell of historic fascination. What Philadelphia is to national patriotism, Baltimore is to the pride of the dental profession, the city of founding and here, we find that giants lived, many of whom grow larger as time goes by. They were constructionists, and not destructionists and in the front rank of these eminent men we find Dr. Chapin A. Harris. If you will pardon the expression, I will say that no man in the profession possessed magnetic powers so well as Harris. He foresaw better than any one the great future for the profession. This same scholar and student contributed liberally to the knowledge of general literature and he was a constant correspondent with the eminent authors of his time. He claimed among his personal friends, the distinguished Rufus Choate, Edward Everett, Longfellow, Lowell, Henry Clay and others equally famed. The letters from these great Americans are still in the possession of the family and I am making an effort to get them, as they are likely to contain many important items of interest to historians. Besides, they will demonstrate his breadth of learning and the

selection of his friends. He might also be regarded as lexicographer, since his dictionaries, as well as encyclopedias, are in general use. It is to be regretted that this great man bestowed so much upon humanity and that in the later days of his life he was practically penniless and further that his family suffered untold hardships because of his poverty.

Possibly the greatest partners in dental practice were Harris and Hayden. Both were men who did much for the general public. Hayden came of sturdy revolutionary stock and his people were indeed of the poorer class, but educational opportunities were found by young Hayden and he certainly improved the meager chances he obtained. The natural trend of his mind was toward geology and he became a recognized authority on rock formations, as well as the geological changes of mother earth. It was he who published the first geology in America, printed in 1821. Later he discovered a new mineral, which since has been called Haydenite. His discoveries in botany merit mention, as they show his deep study of all that pertains to the two great studies in nature. To him belongs the credit of convincing the medical profession of the necessity of oral hygiene and he was the first to lecture in a medical college.

The train next follows the rails toward our national capital, where we stop before the immense shaft or monument reared to George Washington. The tip of this is made of aluminum. When the designers had perfected the base, the question as to how the tip would be made became a great problem. Foundries were invited to make the top or cope metal, but none was able to bring forth the metallic product. Then came upon the scene a dentist of the name of C. C. Carroll, a distant relative of the stern and wealthy signer of the Declaration of Independence, and he showed them how to make aluminum flow to the will and the wish of man. The huge casting of this metal was accomplished by Dr. Carroll and stands to the credit of one of our profession. While we are here in Washington, let us not forget Dr. Eleazer Parmly, who was a prominent writer and educator and a man of the most distinguished acquaintances in this and other lands. He wrote a book devoted entirely to "Children and Their Pleasures." In 1861 he visited Napoleon III., Pope Pius IX., Robert Browning, John Tomes and had an audience with

Queen Victoria. His close companions in America were Horace Greeley, Hiram Powers, Buchanan, Read and Healey, the artist. The romance of this dentist and the daughter of Pere Astor filled the pages of papers for weeks. Miss Mary Astor and he were lovers, but the Astor people wished her to marry into European nobility. The daughter was hastily taken to Paris, where she was to wed Baron Von Romph. She informed Parmly of the plans of coercion and asked that he meet her in Paris and there wed. Her departure was immediate and did not afford time to marry before taking the steamer. Dr. Parmly took heed, boarded a boat and arrived a few days too late, the marriage to the baron having taken place. Parmly, however, was considerate enough to call and extend his congratulations. The baroness was practically a captive. She and her master left for Germany, where she, after a few weeks, died of despair and broken heart. Parmly resigned himself to the misfortune and devoted his time to literature. He was much admired by President Lincoln, who often invited him to the White House. This same Dr. Parmly was the first to take a deep interest in prison reforms and at his home the first meeting was held, looking to proper reform in the care of prisoners. This organization has grown until it now contains the most distinguished men of the land. President Hayes pronounced it one of the most humanitarian efforts in the scope of government supervision.

While we are here in Washington and speaking of our men who have contributed to the general weal, let us not overlook that eminent and beloved genius, Dr. Edward Maynard, who might be known as the great blacksmith of our profession. He understood the moulding and shaping of metals better than any one who has yet come to our profession. He was also interested in the finer works of art and was a recognized artist with the pen, the brush and the chisel and one of the foremost men of the Washington, D. C., Sketch Club. During the Civil War he distinguished himself by inventing a breech-loading rifle. This he made in his dental laboratory and when he had it completed, he arranged an interview with President Lincoln and so impressed the executive that he was urged to have a meeting with the head of the War Department. It soon developed that Dr. Maynard had invented a truly wonderful piece of firearms. With

his breech-loading rifle one soldier could do the work of ten and by adopting this method of Union defense, the Union army would immediately be multiplied by ten and assure victory for the Federal troops. It was indeed a fact, for upon placing the Maynard guns in the ranks the victories began to come to the Stars and Stripes and the Confederacy began to retreat and surrender. The final glory came to the North and to Maynard of our profession is the credit of this change in the stream of tide. While in England some years ago I visited the training grounds and arsenal at Woolwich, the greatest in Europe, and through a relative was allowed to visit and see many of the military things of this great place. To my astonishment I was told that the breech-loading device employed by all the civilized nations was an American invention by a Dr. Maynard.

Now, I am taking you across the seas again and showing you a picture of Dr. Evans, another famous dentist, who rendered services for many of the autocrats of Europe. The world is slow to recognize worth, but it does owe to Dr. Thomas W. Evans recognition of the highest kind. During the Civil War Dr. Evans was practising in Paris. He was an American by both birth and training, but hoped to find his fortunes, which he certainly did, in the old world. The Civil War was at its crest point. The North was meeting with defeat and the South was having its failures. The North had its victories and the South claimed its triumphs and in the midst of this uncertainty the Emperor Napoleon called at the office of Dr. Evans to have some dental services performed. The conversation drifted to the Civil War in America and the Emperor was free to discuss the matter with Evans, since they were on the most friendly and intimate terms. Napoleon surprised Evans by saying: "It looks as though the Confederacy will win the rebellion and I am debating with myself whether to recognize the South or not." Dr. Evans, in his own diplomatic manner, assured Napoleon that it did not seem so to him, that he was quite of the opposite view. "But," added Napoleon, "according to the news reports in our foreign papers everything points to a victory of the Confederacy—and I would like very well to know the truth about the situation, but to find one sufficiently reliable, there is the difficulty." Dr. Evans remarked that it might be possible the Emperor was reading the

wrong kind of papers and that his information was colored to please the European situation, when Napoleon remarked: "I wish I had some trustworthy messenger. I would send him to the United States and investigate." To this suggestion Dr. Evans replied: "I will go if you wish," adding, "I will go to America and see Mr. Lincoln. I will visit Washington and learn the real truth of the situation. I know that the North must win. I believe that I can bring back to you evidence that will prove this. You know that I have never deceived you, and that you can trust my report." Then he added: "Please do not be in haste about recognizing the Confederacy—delay that action until my return and you will never have cause for regret." The dentist had accomplished his purpose and a great Emperor entrusted to the care of one of our profession the delicate task of sounding the real underlying situation of two enormous war forces. Whatever this dentist might say in reporting would change the entire circumstances of the European attitude; hence the importance of this mission. Dr. Evans went as the special envoy of Napoleon, he went as a diplomat of a great nation and his findings would be important as to the outcome of the war.

If France recognized the Confederacy, Spain would quickly follow suit, and Italy, too, would take a similar stand; then Germany and England, the latter eager, though hesitating, would also lend her approval. With such a European change, the friendship of Russia would mean little. The South would have the sympathy of European power and soon could count on the financial aid of these great nations. Dr. Evans came to America. He had a long and memorable interview with Abraham Lincoln, who saw how important it was to thoroughly convince the dentist of the real outlook and Lincoln certainly made it clear that the war would end in a Federal victory. Dr. Evans was shown every detail which would bring conviction of Northern supremacy and his mission was not in vain. He returned to France, gave a conclusive report that the South was failing, that its army was practically defeated and that Lincoln emphatically called attention to the recent victories and ultimate successes of the Federal armies. Emperor Napoleon was won over to the North. I am now unearthing the correspondence and the facts in this Evans' mission and we will find him eminent as a diplomat.

We depart from Washington and journey towards Pittsburgh and here we come in touch with the great industries of Western Pennsylvania. Possibly the invention which has changed more fortunes and caused more financial comment than anything in recent years is, the oil well shooting. This remarkable invention and discovery is the result of the labors of a dentist by the name of Dr. Roberts, of Titusville, Pa. This has made oil production a simple process and we can take comfort in the thought that this important method has been the invention of one of our calling.

The charitable work of Dr. Jonathan Taft, of Cincinnati, has been recognized. The literary world has copied from this genial, kind and liberal-minded soul, many of its most important ideas pertaining to the proper indexing of literary works, either in book, journal or magazine form. Dr. Taft's published index to medical and dental literature bears date of 1886, twenty-four years ago, and shows how well he comprehended what we needed. It was the beginning of a new awakening in general literature and libraries have copied from his system, all of which indicates his superior wisdom in this educational field.

To the old city of St. Louis we speed and also find several who merit our consideration, Dr. Henry James Byron McKellops being the first to claim our attention. This cultured Southern gentleman did much to place his name with this class of practitioners. He was the first to recognize that the dentist should be broadly informed and with this in view he expended more than \$25,000 on a library which contained volumes connected with our art and science. He was also a soldier in the cause of the Confederacy and his house was the headquarters of enthusiastic secessionists. The Union army captured him and placed him in prison, but his influence was so great, because of his friendship among those of the North and South, that he was taken out of prison and marched to the outskirts of St. Louis and told to depart and not show himself again in the ranks of the enemy. This was an unusual military proceeding, but history seems to give it credit. He left, with a small party, for the far West. They anchored in a valley in Montana, and it belongs to history that Dr. McKellops was sufficiently informed in medical practice to deliver the first white child born in the State of Mon-

tana. He later went to Europe, where he acted in precise opposition to Dr. Evans, since McKellops earnestly labored to have Europe recognize the Confederacy. When the war was over he returned to St. Louis, where he associated with the most talented in the South.

This lecture would be certainly incomplete if I failed to direct your attention to Dr. G. V. Black, who recently, in our city, received the greatest dental tribute ever given in this country. I wish I might have time to detail to you his researches in realms other than dental. Incidentally let me remark that his studies of the causation of atmospheric disturbances—winds and cyclones—are recognized scientific deductions. His contributions to the literary elements of various educational organizations are of a most praiseworthy character. The mere mention, by title, of his writings, other than those which deal with dentistry, would consume considerable time. You are all familiar with his career and his contributions to both the physical and the literary field, other than dental, have been many and important.

The evening's lecture has fulfilled its mission if you will appreciate the fact that it is not enough for you to be a good, faithful and serviceable dentist, but that you are supposed to be interested in the great and human service about you; make yourself a part of the political scheme of your country; lend your efforts to worthy civic movements; place yourself in an attitude of a charitable citizen; go out and be a factor in art and science organizations and by this means satisfy yourself that you are in truth serving your country and profession as well. By this new and higher plane you will find recreation and will assist in raising the standard of your profession, since the world will feel that you are elbow to elbow in the ranks of the broad-minded and liberal-spirited men who form the army of progress in the work of this generation.

**FIRST DISTRICT DENTAL SOCIETY OF THE
STATE OF NEW YORK.**

November 6, 1911.

A regular meeting of the First District Dental Society of the State of New York was held at the Academy of Medicine, 17 West Forty-third street, New York City, on Monday evening, November 6, 1911.

The President, Dr. W. W. Walker, occupied the chair and called the meeting to order.

The paper of the evening, illustrated by lantern slides, was read by Dr. H. S. Upson, of Cleveland, Ohio. (This paper is printed in full at page 3 of the present issue of THE JOURNAL.)

Discussion.

Dr. Charles L. Dana—Mr. President and gentlemen: I came here to express my appreciation of Dr. Upson's original and important work, and, having done this, I believe I can contribute nothing more to this discussion, because he really has the facts and has done the work. I wish, however, to express my sympathy with the line of investigation which he has followed. I think that anything which tends to fasten the attention of the surgeon, dentist and hygienist upon the teeth is of value to our public health, irrespective of the neuroses or psychoses. In going through the wards of hospitals or in examining cases at the dispensary nothing strikes me as more pitiable than to see how almost uniformly bad are the teeth of our hospital and dispensary patients.

You know the neurologist has not only to look at the tongue, but also to examine the teeth, and I think he is probably especially impressed with the seriousness of dental conditions. Therefore I hope that whatever else comes of this, it will at least draw attention to these conditions.

In favor of the views of Dr. Upson is the fact that physicians now attach a great deal of importance to conditions of sepsis from the mouth. It has been observed that certain cases of pernicious anaemia are closely related to bad oral conditions, in-

volving teeth and gums. Some cases of this disease have been relieved by the removal of this sepsis and bad dental conditions.

I know of one case of melancholia which was attributed in part at least to a septic tooth, and the patient, who was a prominent physician, was treated on that basis, and he got relief. I have seen also a septic anaemia caused by a bad tooth.

Dr. Upson's views are also perhaps in accord with the new psychology by which we are taught that every harmful sensory impression is recorded in the brain, and becomes perhaps potent for mischief later on. So even our unconscious pains may be in a way registered up against us, reappearing as some form of nervous or mental disturbance.

On the other hand, it seems to me it would be very unfortunate for you gentlemen here to accept the doctrine of Dr. Upson without a great deal of caution. The tendency of psychologists I am sure is to feel that the serious psychoses have a very strong constitutional basis; that a healthy, well-balanced brain and nervous system can stand any amount of reflex irritation. We see cases, for example, of the most horrible and painful tic-douloureux lasting for fifteen or twenty years without any mental impairment.

Then again you must bear in mind that the large majority of the constitutional psychoses such as the doctor has referred to are cases that have remissions. Some of them run a course and get well, while others almost always have some natural remission. This fact I see the doctor has taken into account; but, after all, two and three years is not enough for a proof. A case of melancholia may have a remission for ten years and then begin to have recurrences. I think that Dr. Upson, when he publishes his full work, ought to publish his failures as well as his successes. Perhaps he has not had any failures, but if he has they should be included in the history of his therapeutics.

Then, again, of course we must remember that there are so many millions of people who have bad teeth who yet do not have psychoses, and when you come to think of that it must be admitted that the irritation of impacted teeth and sepsis of diseased teeth if it ever does any harm does so because it breaks down the equilibrium of a badly balanced cerebral system. The statement that continued sensory irritation of any kind may cause insanity

is a thesis which I think it would be very difficult to prove unless you grant to the patient a very considerable instability of constitution with it.

Dr. Frederick Peterson—Mr. President and gentlemen: I have had the pleasure of reading this paper before it was presented to-night. I have also been familiar with Dr. Upson's work for several years past, and when I was asked to come before you and discuss this subject I thought that I would jot down, for the sake of accuracy, my general opinion with regard to the whole subject of the relation of dental disease to serious nervous and mental disorders.

There are two questions that the doctor has sought to answer in his present paper. One is whether a lesion of the fifth nerve can produce a serious brain disorder?

I would say frankly that I have never seen a case in which lesion of the fifth nerve in itself brought about a brain disorder. I have, of course, seen mental depression as an indirect result of a severe facial neuralgia, especially where such neuralgia has interfered with the proper mastication of food and consequently with general nutrition.

The second question discussed by the reader of the paper as to whether impaction of erupting teeth will produce pathological manifestations in the brain, in the way of mental disorder, if propounded to me, I should have to answer in the negative. I ought to qualify this by stating it to be a *belief* on my part, founded upon my experience thus far, and to add that I have not paid attention to the condition of the teeth in mental diseases which Dr. Upson himself has done and so carefully reported upon to us.

We know that specialists in any field are prone to be over-alert in matters pertaining to their particular line of work to see in the particular organs of their specialty an importance in relation to the whole that does not always exist. This is the personal equation that few can escape. It shows itself often most markedly in those who are the most enthusiastic and the most honest in their work. In fact, the very emotion of enthusiasm tends to blind us to the whole truth, at the same time that it stimulates work and focuses the interest strongly on the immediate matter before the eye. The best judgment is cold-blooded, unemotional. This very

focusing of the attention on a single part leaves other parts out of focus—so to say.

Lombroso, as you know, was an extremist in his point of view as regards the delinquent man. Dr. Gould has made unusual claims as to diseases of the eye in relation to the causation of many nervous diseases. Dr. Stevens and Dr. Ranney, you will remember, devised the cutting of eye muscles for the cure of a great variety of serious diseases of the nervous system. Similar claims have been made by eminent men in connection with diseases of the nose and throat, the stomach, the uterus and ovaries, and we are having to-day a certain over-emphasis of gall-stones and hyperthyroidism as factors in the causation of many disorders. Recently we have had in the domain of morbid psychology the work and views of Freud, which, valuable as they are, are still, it seems to me, extreme. It is perhaps rightly demanded by all of these men that no one be entitled to judge of their claims or their results unless he has gone over the work himself quite as carefully as the authors, and this is a just criticism of many critics, who have repeated none of the observations, but condemn on general principles. I mention these instances because they seem to me to be to the point. No one I think will deny the great value of the work of enthusiasts like Lombroso and Freud and others, that they have measurably added to our knowledge, stimulated endeavor in new fields, focussed our attention on matters that might have been overlooked.

I feel the same way in regard to this work of Dr. Upson. He is a noted neurologist in Cleveland for whose opinions and statements I have the greatest respect. Of his qualifications, honesty and enthusiasm there can be no question, and I believe the work he has done and is doing in this particular line cannot but be productive of great good in the end. It will lead us to investigate dental conditions more closely than we have ever done before, and his work emphasizes still more the necessity of neglecting nothing in the body, of overlooking nothing, in our search for causes of nervous and mental disorders.

Dr. J. Madison Taylor, Philadelphia, Pa.—Dental irritation as a source of causation for obscure neuroses and psychoses has long interested me. About fifteen years ago a valued friend, himself a physician, suffered mental eclipse through the blunders of

a dental surgeon. When almost a derelict, he was reclaimed by a wise expert. He himself inferred the probable cause. This taught me a sharp lesson.

Skiagraphy opens wide the door for exploration. Dr. Upson is the pioneer in a line of therapeutic research, the neglect or condemnation of which, till carefully considered and tested, would be a great economic folly.

Remedial resources in neurology are, by common consent, meagre enough. To search with precision so promising a department of reflex disturbance as the teeth, both the obscure, non-sensory and the more patent lesions, is plainly a duty. The field may prove limited. Several cautious masters of medicine have chidden me as a puerile enthusiast. Then again, the field may prove so rich a source of relief, or even cure, that the most sarcastic may then hasten to explain away their original utterances.

I have been familiar with Dr. Upson's recommendations a little over two years and yet can congratulate myself on some most encouraging results from following them. My practice may be negligible compared with the great nerve conquerors of Gotham. But in that brief space so large a measure has come by using the skiagraphic test that my cases are at least worth mentioning.

In the short time allowed in a discussion, it is not permitted to relate cases at length. Suffice it to say I shall report the more notable ones elsewhere. Two of them were well marked instances of sudden mental retardation, classified as dementia precox, and so pronounced by competent predecessors who had exhausted their own resources in vain.

One, a young man, pitiably insane, with marked circulatory defects, sullen, explosive, inert, negativistic and stereotypic, obstinately constipated. Skiagraphed by Dr. Pfahler; had seven teeth removed, four abscessed roots and three others atrociously diseased. Pulse, sitting, 50; standing, 150; clammy, cyanosed surface, etc. In a few weeks after teeth removals the pulse was normal and notable changes for the better had occurred throughout. He is not now mentally sound, but is vastly improved in health and behavior, is docile, obedient, co-operative; circulation, digestion and bowels are normal.

The second case, a handsome young woman, living in a large

country town, who for three years had lain in bed, refusing food, refusing to pass feces, rebellious, implacable, a helpless mass of negative human protoplasm. Her teeth were pronounced by her dentist absolutely sound. It was necessary to bring the skia-graphing outfit to the house and to use full ether anaesthesia. This was done twice, and the second attempt showed a probable abscess at the base of a tooth. On removal the abscess was found. Now she is pronounced by her family to be 90 per cent. better; takes the air in an automobile daily and mingles cheerfully with her friends.

The third, a young man whom I took the liberty of labeling *dementia precox*; a divinity student from Virginia, who, for no explicable reason, fell into a morose state, fears, doubts of all his earlier convictions, delusions, marked mental retardation, etc. It required much diplomacy and some force on the part of Dr. Pfahler and myself to get a skiagraph. One abscessed tooth was revealed, removed and no other special treatment pursued. In a few months our patient was pitching on the Roanoke College baseball team, with excellent effect.

The fourth case, a robust young physician, who rather rapidly developed profound depression, physical deterioration, suicidal and homicidal tendencies—feared he would shoot his wife and child—wept piteously on my shoulder, etc. He consulted every medical man of prominence in our city without relief, and finally veered round to me among the lesser lights. To be sure, I did several things to help him regulate his life as far as possible: counselled retaining his appendix, jeopardized by eight or ten surgeons; his gall bladder, coveted by ten or fifteen more; rescued him from several rest cures and divers and sundry other orthodox means of relieving the effects of an abscessed tooth. Somehow he refused to be skiagraphed, but I pounded on his teeth till one gave evidence of tenderness. Here the matter rested for some weeks. He was better because of my skillful psycho-therapy and dietetic regulation. One evening he 'phoned and begged me to go with him to Dr. Thomas to have the suspected tooth out. A more pitiably fear-thoughted person than my patient I have seldom seen. He almost escaped us. Finally the tooth was extracted, a big abscess was revealed, and prompt mental recovery followed.

These few cases will serve to illustrate what an unsuspected abscessed tooth can do.

I could relate scores of cases where badly-filled teeth, fillings resting on exposed pulp, proved a large contributing factor in neurasthenia, psychoses and divers distressing, but apparently unrelated, maladies. The subject opens up a new field of clinical pathology.

Finally, one word about our researches in skiagraphy at Elwyn and Vineland, where there are a total of 1,600 backward-minded children.

Dr. Upson, Dr. Kanaga and myself selected some two score cases; studied the teeth and found malformations, maldevelopment, crowdings, impactions, etc. The results will be related in full elsewhere. Dr. Pfahler and Dr. Manges did most of the expert work. In one conspicuous direction many—nay, most—of these cases were benefited, viz., in conduct.

Importance of Tooth Removal.

Since these researches and operations were made among and on young persons, final results can only be estimated some time hence: so far the results are decidedly encouraging. I believe firmly that our duties to persons suffering from such psycho-neuroses as mental retardation, cloudings, negativisms, psychomotor disorders, hyperquantivalent and fixed ideas, phobias, disorders of attention and personality, of feeling tones, etc., are not discharged till a full skiagraphic exploration has been made of their teeth and all those removed which come under grave suspicion.

It is only by such work, as Dr. Peterson has pointed out, that new methods are brought to full fruition. The subject is one of great promise, is in its infancy, and demands careful investigation.

I notice in some of the remarks so far reference chiefly to the effect of sensory irritations. These are not under discussion. The cases that Dr. Upson and I have in mind and the experience to which I have referred are largely in non-sensory, obscure irritations, where at least characteristic sensations had not come up to the threshold of consciousness. This is where the greatest promise for betterment lies.

I have talked the subject over with some of our best X-ray experts. One of them told me that he had been instructed by the physician in charge to examine for conditions causing painful contractions in the muscles of a certain young woman's leg, and after he did so found nothing wrong there. He was interested in my work at that time, and proceeded to examine her teeth and found an unsuspected abscess. After treating the abscess, by removing the teeth, she promptly got well. I have talked to several prominent dentists and they have all had similar experiences.

It is not for a moment to be suspected that very serious and grave organic disease of the brain is to be attributed to any such single cause as referred trouble from the teeth, whether it be sensory or non-sensory, but it is more than probable that a number of so-called cases of psychoses and neuroses are passing from one nerve specialist to another and finally escaping to Christian Science and the like cults, who can be rescued and made much better citizens, if not made absolutely well, by proper attention to concealed, non-sensory lesions of the teeth.

The field of this research may be limited, but within its limitations it may offer the only—or the best—means of removing serious psychoneurotic disorders, and occasionally restoring the sufferer to a life of usefulness. In so far, it is a privilege which I, for one, welcome to test its value. In my own experience distressing instances have been immensely bettered by correction of dental lesions, where I was the tenth or twentieth physician consulted, and none of the others—better men than I—had succeeded at all.

Dr. Luther Halsey Gulick, Director Department of Child Hygiene, Russell Sage Foundation—The investigation of some tens of thousands of records of school children has been that, on the average, children having decayed teeth—several cavities—take something over five months longer to complete their elementary school course than do children who do not have this disability. It is, however, a very different thing, Mr. Chairman, to recognize a fact and to give the true causes which account for that fact.

The fact that children having decayed teeth are, on the average, slower in completing the elementary school course may be

accounted for in two ways: first, persons having sensitive teeth chew their food less effectively than do those not having this disability. In many cases they also eat less food; in either case a fundamental factor in nutrition has been interfered with. Children show this in lessened vigor, in a lower height and weight per age, or, in the second place, decay of teeth may perhaps be associated with lowered vitality; that is, defectiveness of teeth may be merely one expression of lack of vital ability, and this lack shows itself in inefficient scholarship, lessened height and weight, as well as in defective teeth. In any case the defective teeth demand correction.

As to the relation between impacted teeth and insanity or moral perversion, I have no original contribution to offer. What Dr. Upson has told us this evening is most interesting, and we are all to be congratulated upon having the opportunity of hearing him, and he is to be praised for the large amount of earnest and scientific work which he has done. In his ultimate publication of this material he will, no doubt, publish serial cases which will give us the evidence in somewhat more tangible form than he has been able to present it in the brief time allowed him this evening.

Knowing as we do that the emotional life may be profoundly disturbed by drugs, by constipation, by interference with the monthly function of women, and in many other ways, it would seem to be not impossible that other irritations should also affect the emotional life, aiding in the production of that emotional unbalance and belief, and those delusions which we so commonly see as the early steps in those who are departing from normal life. In other words, it seems that departures from the normal are more apt to be related to the emotions, to the beliefs, to the point of view, than to the intellectual processes themselves; that emotion and intellect are two different things. I cannot very well see how the irritation due to impacted teeth can produce an intellectual twist; that is, I cannot see how two and two can be made to appear to be five because there is a certain neural irritation. I can see how a persistent depressive emotional state may be superinduced by constant irritation, which may lead one to misinterpret the acts of other people, to imagine persecution, and the like.

Our present notion of psychology is that it is primarily a functional affair. The old idea that there are faculties of mind has been thoroughly discarded. This fact in itself enables us to see more clearly how a persistent irritation may interfere with a function, even though we might not be able to see how it could interfere with a faculty.

Again I wish to thank Dr. Upson for the excellent work that he has done.

Dr. Kirby—I feel sure that any one working in the hospitals for the insane must feel that the teeth of the patient's as we see them have been very sadly neglected, not only before the patients come to the hospitals, but afterwards. Dr. Upson's work in this field will serve a very useful purpose if it does no more than awaken the interest of the hospital physicians.

In the New York City hospital service the patients' teeth do not receive the attention which they should. Each city hospital has a visiting dentist, who comes once a week, or less often. He attends to only the more simple and acute cases. A resident dentist should certainly be employed in every State hospital, and we now have a plan by which we hope to bring this about.

Dental lesions are not the cause of any special mental disease, but irritation or pain may in some manner not clearly understood bring about abnormal mental conditions. The main support of this hypothesis is that correction of dental lesions seems to result in improvement or recovery in patients mentally deranged. I must frankly say that I cannot agree with Dr. Upson in making this simple correlation between cause and effect.

Dr. M. I. Schamberg—It affords me much pleasure to discuss this paper, in that it comes from a specialist in neurology, a man who has stated his case in an absolutely unbiased manner, and a man who is in search of the truth, as evidenced by the tenor of his paper.

It is an interesting fact that many observers are prone to find the thing that they are looking for, and this statement has frequently been made in reference to men who first land upon a truth. It must also be impressed upon our minds that the best of scientific men have sometimes permitted very potent factors in disease to escape their notice. And it is because of several cases that have recently come under my care, which responded

in almost a magic fashion, that I feel it my duty this evening, even though the hour is late, to show several slides. These cases undoubtedly suffered from mental and nervous disorders of a very pronounced character, which disorders disappeared following the removal of the local cause.

It would be poor logic for us to allude to insanity, dementia, peculiarities and other forms of mental disturbance as being frequently due to dental disease, when we consider the almost universal prevalence of dental disease. In the large proportion of cases of impacted molars that I have operated upon within the past fourteen or fifteen years I have never seen more than two or three cases of mental depression. I have seen many patients who have suffered extreme physical pain. However, in a proportion of cases in which the subjective symptoms as far as the local dental disorder was concerned was nil, I have noted that mental disturbance was out of all proportion to physical pain.

[Dr. Schamberg showed several slides, illustrating various forms of impaction that are generally unrecognized, owing to the fact that the teeth appear to be in almost normal position.]

I want to make reference to the fact that in some of your mental cases, in searching for the cause in the mouth, about the jaws, the radiograph may not invariably expose the seat of trouble.

I have seen some of the earlier pulp degenerations, which no radiograph can bring out, the most exciting cause of a typical tic-douloureux. In one case the patient had the paroxysmal pains shooting through the side of the face, and had just about made up her mind, because my radiograph failed to disclose the trouble, to have the nerve of the face resected.

Finally I detected one of her teeth which responded rather poorly to sensation, I referred her to a dentist, and upon extraction of the tooth all her pain subsided completely, so that even radiography, though it has been a wonderful aid to us in this work, will not do it all. It requires collateral work in the study of the mouth, if the best results are to be achieved.

A patient, a young man, was brought to me in August, 1910.

Up till his sixteenth year he was decidedly bright and well advanced in his studies, but about his sixteenth year he became mentally deranged and changed from an energetic individual to

a person with lazy habits, getting up late in the morning and failing to attend his place of business at the proper hour. Did not care to mingle with people, had a stolid look, was easily provoked, and was surly, which condition lasted up till several weeks after I had operated upon him, removing several impacted molars. Since this time there has been a steady improvement.

Three weeks prior to his consulting me his condition became so bad he was unable to continue his work as machinist. He claimed that the noises in the shop excited him. His nerves as well as his general strength gave way.

An interesting point in connection with this case is that immediately after operation he showed a condition of increased mental disturbance, and was even more irrational than immediately prior to operation. This lasted about a month, when they improved. Six weeks after operation he started to work, and has since been employed as machinist in an automobile establishment.

It is now about sixteen months since the operation, and his brother, who called upon me a few days ago in response to a letter directed to him, to find out the condition of the patient at the present time, said that the family considered him 90 per cent. better. He is now living away from his home in another city and appears to be normal in every respect. His brother stated that the 10 per cent. was lost because he did not want to remain at home.

Another patient, a young lady, nineteen years of age, Miss C. L. P. This patient had had several epileptiform attacks, dropping over suddenly, becoming absolutely unconscious, and the last time struck her head forcibly against the piano.

She had attacks on August 21, September 3 and September 23. Operated upon her after securing a radiograph. I might state that Dr. J., in interviewing the patient, found that she had a sense of fullness in the upper part of the face; no interior pain. Radiograph taken disclosed the upper molar tooth impacted. Only one molar in each jaw, and still there was an impaction of this upper molar tooth which did not present in the mouth. The same condition existed upon the opposite side of the head.

I operated upon her in the hospital on October 4, removing these two unerupted teeth, and since that time she has not had

an attack, has been feeling better in every way, and has not felt that sense of fullness mentioned previously.

This young lady had been having these attacks about every ten days to two weeks, and had had four attacks, which have been checked absolutely by the removal of these teeth. This I believe to be one of the most significant cases, in that we are able to note the absolute influence of impacted teeth, and other forms of inflammatory conditions about the jaws, produced by dental disease upon the nervous centers.

In closing, I again wish to emphasize the fact that it is seldom the gross lesions about the jaw that create the greatest amount of disturbance. They are usually trivial conditions that can scarcely be detected by a radiograph alone. In many instances it is something of a very minor sort.

I have had several patients within the past year who had threatened suicide. One woman within the past few weeks told me she had the revolver to her head on several occasions, but lacked the courage to pull the trigger. Her trouble was due to a little inflammatory area which remained after extraction of a tooth.

The patient did not suffer intense pain, but had a peculiar distress, and she acted as irrationally as any one possibly could. She told me her family thought she was insane. Shortly afterwards, after curetting this region and treating the part, she finally came in one day, with her face beaming, and said: "Doctor, I do not know what you thought of me. You must have thought I was crazy, but I feel like a different woman. My husband could scarcely tolerate me; I made every one unhappy, and I am now just like a different woman."

This is but one of many cases where there is a general improvement in health following removal of disease about the jaw.

Dr. Robert T. Morris—These discussions of the paper are very instructive. They subtend much of our work in surgery at the present time. It seems to me that two or three of the cavities in this discussion may be filled with rather simple principles.

In the evolution of the vertebrates we find when a certain stage has been reached that Nature seemed to set a limit. The horse, cattle, homo sapiens, if developed to a certain stage, must remain at that stage, or degenerate.

Let us take an example in botany, with the rose. Take away obstacles in the way of development of the rose, and its stamens become petals; it loses the power to propagate its kind; it is attacked by the various enemies which the wild rose resists, and it disappears.

Now we have in the higher development of men in the generic way this evidence of Nature's limitation of development, and when a certain stage has been reached we find in evidence the objective sign—stigmata of decadence. With the very teeth which have been described here to-night we read the hieroglyphics stating a history of lack of nervous development which will correspond to these hieroglyphics in the mouth of the patient.

Now, then, may we not classify our patients in this way? I am trying to simplify matters, and, starting from a larger circle, getting down to the topic under discussion.

In this group of decadents, of which almost every one of us is a representative to some degree, we find a certain number with very unstable nervous organization. In this unstable group a number of peripheral irritations may precipitate the minor psychoses. Do not understand me to say that any peripheral irritation stands in causative relation to a grave psychosis, but do let me state my belief that many peripheral irritations stand as precipitating factors in minor psychoses, such as have been described by the reader of the paper to-night.

Aside from the direct peripheral irritation, the reflex disturbance manifested in pain, in disturbance of sympathetic ganglia, we may have in concatenation various toxic processes resulting from disturbance of the digestive function, and these in turn have their own group of precipitating influences upon the minor psychoses.

Let us get now to the point of keeping a good sense of proportion. Gentlemen, that is the main thing for you to remember. Keep, if you can, a good sense of proportion. When certain authors like Stevens, Ranney and Gould have blazed the way, shown us vistas of light into the new field of eye strain, men have said they tried to comprehend too much, and what men said was true. It was said by serious men out of their experience that the work of Stevens, Ranney and Gould tries to comprehend too much; but in the midst of this there is a vista showing the

precipitating factor in some cases of mental disturbance. We will find that the men who believe loose kidneys may produce insanity have also a reasonable basis for a certain part of their conviction.

Those who believe in the danger from errors of refraction, those who believe in the influence of gall-stones, and of various peripheral irritations, have a good basis, and we must know that in many cases of irritation from defective teeth, of irritation from toxic processes, we may have secondarily many minor psychoses precipitated. If we relieve the peripheral irritation in these patients of unstable mental equilibrium, we shall have apparent cure in a certain proportion of cases, but let us report consecutive series of cases only. Selective reports place undue emphasis upon points which may lead us far astray, and failures must be reported quite as well as successes, if we would aid true science.

The work reported to-night will be of immense importance as part of a group of facts now being gotten together as data for our new knowledge.

Just one other point: Ross, Sherrington and Head have shown us how irritation of any organ may send an impulse to a certain segment of the spinal cord, and that impulse may be reflected to somatic nerves from that segment of cord. This relates to a part where we may easily take testimony, and easily report our findings, but when we deal with reflex to the brain we enter a speculative field, in which we may not have that definite demonstration which proceeds from irritation of a segment of spinal cord. In this particular field of psychosis let me state a general principle upon which surgeons to-day stand after their long controversy with the neurologists. There has been bitter controversy, there have been mutual recriminations, unwise, but in the course of the development of the race necessitated, according to Nature's plan. The surgeons have seen certain excellent results from operative surgery in this decadent class of patients, where the precipitating factors were removed. The neurologists, on the other hand, believing rightly in the fundamental defects present, have been so sceptical that we have been at opposite sides of the discussion.

At the present time we may all stand upon one basis, and those of you who have discussed the paper to-night may join us

in standing upon this basis—that you should do for your patient whatever should be done upon general principles. If he has suppurating teeth, care for your psychosis patient upon the same basis as though he were well in every other respect. If he has abnormal teeth, undeveloped teeth, do with those for your patient with a psychosis as you would with the teeth of a strong man. Reduce this question to one of general principles, and you will not be wrong. Care for teeth requiring care. If the patient is incidentally relieved from a psychosis, it may be the result of lessened toxemia from the intestine, quite as well as an effect of direct removal of a peripheral irritation at the site of defective teeth.

Dr. M. L. Rhein—I feel that we are very much indebted for the paper we have listened to, and to the men who have discussed it.

There is just one point in this discussion that, to my mind, has been overlooked. I doubt if there is among the dental men in the audience a man who could not enumerate cases similar to those that have been given to us this evening by Dr. Upson and Dr. Schamberg. I know that I could talk for hours describing cases of this kind, of which I have both radiographs and copious notes, and it comes down to the fact brought out by Dr. Morris—it is not a question whether there is a pathologically disturbed condition of the brain or not. That is not the real issue. If mental disturbances take place from these points of local irritation, and are cured by the removal of the local irritation, it seems to me this sums up a great deal of the gist of the matter.

Now the other point is this: In Dr. Upson's admirable paper he shows very excellent results by the removal of a large number of teeth, and this demonstrates to us as dentists the ignorance of the general medical practitioner in regard to things pertaining to the mouth. If the mouth is to be examined by neurologists it is important that they should be so educated that they are able to understand what they see when they examine the mouth. How many neurologists can say that they are so educated?

I agree with Dr. Upson in one thing: If nothing else can be done, those teeth should be removed rather than left in position; but I am sure all of the dentists in this room realize that in a large number of the cases shown on the screen by Dr. Upson the

same results could have been obtained without the loss of most of those teeth. The points of irritation are produced, as he so well said, by pulp disturbances or sepsis from the ends of the root. All of these conditions in most of the cases are curable, and are curable in such a way that all these points of irritation are then relieved.

I simply want to inject that important point into the discussion, that this inordinate loss of teeth is unnecessary for the proper therapeutic action in such cases as have been reported.

Dr. Upson—After so brilliant and altogether gratifying a discussion of the subject, my remarks will be brief. There are, however, a few points that I wish to touch on.

First, with regard to the point made by Dr. Rhein, in whose judgment I have great confidence. It is one that appeals especially to dentists. A great many diseased teeth can undoubtedly be saved. From the practical standpoint I think that if Dr. Rhein had seen many of these cases he would have taken the view that extraction was necessary. Financial and personal considerations have to be taken into account.

Many cases are in such disturbed condition that prolonged treatment is impossible. For others the expense of conservative measures is too great.

In order to effect the necessary cure it is often safer to extract, operations that require time being really impossible.

Dr. Dana asks if there have been any failures. There have been, I think, too many. This is in part because in beginning such an investigation one starts in the dark and gropes his way gradually. I think it is useful to report failures, but it is not possible to report fully on such cases. I have elsewhere given statistics which include a pretty full statement of the proportion of failures and successes.

In regard to the causes, it was pointed out by Dr. Peterson that they are always complex; that we cannot speak of a case being due to dental disease alone. I think that is true. I do not believe that any one antecedent condition, either physical or mental, is the sole cause of an aberration. I find, however, in a great many cases that there is one factor of greater importance than the others, which may be the determining cause, and if that is removed, recovery follows.

There are a great many cases of nervous, mental and physical disease which I believe may be improved and possibly cured along various lines of treatment. What we have to do is to locate all the physical and mental irritants in each case that we can find, whether they are lesions, or errors of environment, and my experience with dental defects is that they play a large part among the irritant causes.

I have never contended for either a dental or other cause being an exclusive cause.

Many objections may be made to the theory that pure irritation is often the cause of mental derangement. I believe the presumption is in its favor, and that it is susceptible of ultimate proof.

I simply wish to add that the cases reported in the discussion seem to me of great interest and very significant. The mild and salutary skepticism expressed by my neurologic friends seems to me appropriate, and is desirable in so far as it does not interfere, and I believe it need not interfere, with further observation.

A cordial vote of thanks was offered to the essayist and the gentlemen who discussed the paper.

Adjournment.

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THE AMERICAN ACADEMY OF DENTAL SCIENCE

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, on Wednesday, January 3, 1912.

The topic for discussion was "Do We Need the Dental Nurse?" Papers were given by Drs. William H. Potter, Henry H. Piper, Harvey W. Hardy and John W. Estabrooks.

Dr. William H. Potter—"The Dental Nurse in the School Dental Clinic, with Observations as to Their Use in Europe."

I am interested in this problem because I believe it is vitally connected with the problem of school children. However zealous the dentists are, it has finally got to come down to a financial basis. Unless there is some money consideration the work will not be carried on. That is not a reflection on the profession, but simply states the fact which must seem evident to us all. The first enthusiasm is liable to go by and unless there is something to keep the work going, it will stop. In order to meet this problem we need the services of those whose time is not so valuable as ours. Such work could be done by the school nurse. She would be able to examine the mouths as carefully as the dentist. She, by having special training, would be especially valuable in assisting the dentists who might be connected with the work. I believe if we get to an ideal state of affairs, we will have part of the work done by dental nurses and the other work will be done by the general practitioner. In that way efficiency will be increased and expense will be kept at a minimum. I have made some observations in regard to the value of the dental nurses abroad. The school dental clinic has been more highly developed abroad, as in Germany, than in this country. They have learned some of the necessary steps for the development of this service. One is the employment of the dental nurse, who does the minor things for which it is not necessary to have the service of the highly trained practitioner. In school dental clinics the most highly developed, I found the little town of Berndorf, in Austria, with full equipment and dentist and dental nurse. I have also seen the dental nurse in the school clinic of Berlin. In one dental clinic we have women who are nurses and practitioners. The

practitioners combine the two functions to save expense. They work for a smaller fee than the men practitioners would work for. In that way a larger number of children can be treated. My interest in this discussion is largely because of the important service which the dental nurse can render in the care of the school children, in reduction of cost and in increased efficiency. If we could employ the dental nurse, the private practitioner could increase his own efficiency and reduce the cost to the patient of certain minor operations which could be rendered by one less highly trained.

Dr. Henry H. Piper—Dr. Potter has the advantage. He can say something about the trained nurse in action in Germany. It is very difficult to find the dental nurse in the United States. I might have given you the facts and arguments I have read in recent dental journals. I have here undertaken to meet what seems to me the only great objection to the passage of dental nurse legislation.

THE DENTAL NURSE IN THE UNITED STATES.

It is the purpose of this paper to give a few impressions, or perhaps conclusions, from such study of the dental nurse question as I have been able to make during the past two or three weeks. The conclusions may be faulty, as the study, in the nature of the case, has been rather superficial, but an apology will not help the matter.

One cannot study the literature on the dental nurse very long without observing that this question is closely connected with the settlement of other questions only in part dental and is related to institutions whose well-being the dentist has not been in the habit of considering. The new consciousness of interdependence everywhere apparent is one of the most hopeful signs of the times. It means the wiser and more permanent solving of many difficult problems and the bettering of many conditions for which society, in the broader meaning, is coming to feel itself responsible. The dentist feels this and is sobered by it, but in the end he rejoices in it. The physician and the dentist freely consult together, with profit to both; and as the dentist has been more of a professional recluse, he appreciates more keenly the

tremendous advantage which accrues to himself and to all, from a wider affiliation and a more varied service.

One of the institutions to which the dental nurse would be closely related, is the dental dispensary and particularly the school dispensary. Any one who has had a part in the work of one of these dental aids to the health and efficiency of school children, can appreciate the help which might be given by a school nurse who was also a dental nurse. As the case now stands there is no one to make satisfactory dental examinations except the dentist, whose time should be given in other directions. Both the examination and cleansing of teeth should be given over to the dental nurse. But the school dispensary suggests two other greater institutions—the school and the home—in which the dental nurse, according to her capacity, might render at times a service something more than dental, or rather dental in a broader sense, and in a widening field of usefulness she might easily become a connecting link between the dental profession and every movement for social uplift in the community. Surely there is nothing in the study of the dental nurse movement throughout the country, more inspiring than this new feeling of inter-relation and mutual helpfulness in service.

A second conclusion which cannot long be avoided in a study of dental nurse literature, is the harmony of the movement with the spirit of the times. We live in an age of increasing economy of administration and of conservation and when preventive measures are more and more taking the place of curative. The dental nurse, in what would probably be her chief occupation, both in the office and dispensary, the cleansing of teeth, would labor directly to prevent disease, to promote health, to conserve vital energy and to give scope for a less hampered and a happier life. And this desire for economy of life forces is gaining ground everywhere; it is the soul of all the social service centers and efforts; and not by chance is it affiliated with tendencies in the larger life of the nation. It is the spirit of the times to conserve and prevent, or at least to work and to hope for these things. Naturally, as we look across the water, we find that Europe can teach us something in this direction. Her civilization is older than ours. She has advanced farther in some particulars. She knows more of economy and conservation; her scientific forestry

dates back seventy-five years; her dental dispensaries antedate ours; above all, she feels more than we the sacredness of human life. While it would be too much to affirm that a dental nurse movement so allied is bound to succeed, it is *not* too much to expect that something of this nature, meeting this need, must win its way to success.

Another conclusion which I have felt anew as I have become better acquainted with this problem, is the unwisdom of concluding that a thing which is good, must necessarily be preserved. It is the better thing which we should seize upon if we can find it. A respectable looking block on Washington street comes down and a finer building rises in its place. The old block paid, but the new is better; it gives more for the money. There was expense and loss in making the change, but the advantage is with the new building. Our dental offices are well equipped and serve their purpose. An honest practise is safeguarded in them. If legalizing the dental nurse should entail some disadvantage, trouble and loss, but meet a need of the time so well as to balance the evil many times over, it would scarcely be the part of wisdom to cling to the lesser good. I cannot think of a single improvement, great or small, that has not been ushered in with some wreckage. Change, with loss and yet greater gain, is the law of advance everywhere.

In a number of letters which have come to me, and in the literature I have looked over, relative to the status of the dental nurse in other places, I find plenty of courage and the fighting spirit, with gain in certain particulars; but, with the exception of the State of Connecticut, there appears to be no State in which the dental nurse has a legal standing. The law in Connecticut reads as follows:

Sec. 5. Section eleven of said chapter is hereby amended to read as follows: All unlicensed assistants who on January 1, 1907, were actually employed in performing dental operations on patients in the office of a duly licensed or registered dentist may register their names with the dental commissioners prior to October 1, 1907, upon the presentation of the affidavit of two registered or licensed dentists, stating the name and address of such applicant and the length of time he or she has been so employed, in such form as the dental commissioners shall prescribe. Any

person so registered, as aforesaid, may perform dental operations on patients in the office of a licensed or registered dentist and under the immediate personal supervision of such registered or licensed dentist, but not otherwise. The provisions of this chapter shall not prevent a physician or surgeon, practising as such, from the performance of any operation in dentistry on a patient under his charge, nor a visiting clinician at a meeting of a regularly organized dental society, from performing dental operations, nor an assistant of a registered or licensed dentist from performing the so-called operation of cleaning teeth.

It is reported that dentists in the State of New York are training assistants in the duties of the dental nurse. Other reports indicate that a strong effort will be made in the spring to secure for the State, dental nurse legislation.

One does not find many or serious objections to the dental nurse idea, except in the difficulty of introducing a new provision into the dental laws. It is urged that the times are not ripe for this departure; that if the service is important it should be performed by a dentist; that it will lower the dental profession to introduce nurses. A few dentists believe that the cleansing of the teeth by a nurse, under the supervision of a registered dentist, is not an infraction of the law and that the courts would not hold it to be. A very few dentists have tried to solve the problem by hiring an assistant practitioner, but this has hardly proved satisfactory. So far as can be judged, the great body of dentists favor dental nurse legislation.

UNIVERSITY OF CALIFORNIA, DENTAL DEPARTMENT.
OFFICE OF THE DEAN.

SAN FRANCISCO, CAL., December 26, 1911.

Dr. Henry H. Piper, 247 Pearl Street, Somerville, Mass.

My Dear Dr. Piper:

I have your favor of December 18. The matter has been discussed to some extent in our school and we have considered the advisability of training dental nurses, giving them certain courses of instruction in hygiene, dental anatomy and certain special subjects, together with the fundamentals of anatomy, pathology and physiology. These latter subjects would be given in rather a limited way to train such nurses in prophylactic work and as

assistants to senior students in malleting and such general office practice as they may be called upon to do.

"We feel there is an excellent field for women in this particular sphere, and that a woman with such training would be a very helpful adjunct to dentistry of the present day. The Board of Examiners of this State, however, have ruled that no one who practices upon the mouth in any sense has a legal right to do so, unless such person has taken the State Board examinations and qualified as a licentiate.

"In view of the fact that nurses with very limited periods of training, in some hospitals one year, in some two and others three years, are permitted to administer hypodermic injections of morphine and render such valuable assistance as they are capable of doing in modern surgery, it seems that such work as a dental nurse might do could be classed in this category, without injury to the health of the people. * * * * *

Yours very truly,

JAMES G. SHARP, *Dean.*

Dr. Harvey W. Hardy—"Do We Need Her Now?"

"THE DENTAL NURSE IN MASSACHUSETTS."

It would seem as though a paper on the need of a dental nurse were almost superfluous. You might about as well ask does a dentist need two hands, two eyes or two legs? And yet it is a subject that should receive our keenest attention at the present time. We have never felt the need of the dental nurse as now. The present dental law is very restrictive and makes it unlawful for a man to employ an assistant to do any of those little things for the patients which would so much assist the busy man. There is hardly a day of the week or an hour of the day that we could not find work for such a trained individual as the proposed law will produce. The dentist's day is short and time is money and every minute that such a nurse could save him by wedging, polishing, examining, dressing teeth for the relief of pain, adjusting clamps and rubber dam, taking impressions, etc., would be money in his pocket.

I regret very much to have to say it and should only venture to make such a remark before the dentists themselves, but if there is any one thing that the average dentist hates to do and

admittedly considers drudgery, it is cleaning teeth; and yet there is nothing that the general public is so much in need of. Think what a dental nurse trained—and when I say trained, I mean trained—think, I say, what a grand work a dental nurse trained for this purpose, as she would be under our proposed law, could do, and what a great step forward would be taken in our fight against decay. All who practice proper prophylactic care of the teeth and teach their patients how to perform their part in the matter, know that from 50 to 75 per cent. of the cavities can be avoided. You all know I am a crank on the prophylactic care of the teeth and that I consider it a very important part of my work, if not the most important, and, while I cannot say that I would want to delegate that part of my practice to a dental nurse, if I were allowed one, they will do a vast amount of good and it will not be long before the public will demand such a concession from us.

Neither you nor I would be willing to devote hours of our time to polishing unless we received practically the same remuneration for it that we do for other work. The discriminating public will not cease to visit their dentist for the desired polishing because of the existence of the dental nurse, while she will be available for the general public, who are so sadly in need, but can ill afford the luxury of a dentist's time for that purpose.

Under the proposed new law we shall accomplish the standardizing of the requirements of a dental nurse, which will eventually, to a great extent, standardize the dental offices; and I think you will all agree, after due consideration of the proposed new law, that it is about as restrictive as a law could be and that our board of registration in dentistry, in supporting it, will strengthen rather than weaken its hand.

We claim to be a part of the medical profession, and, if so, are we not entitled to a privilege which they have enjoyed for some time? Dr. Gay informed me that the State Board of Medicine made no objection whatsoever to the registration of medical nurses, but that their fight came with the nurses' association, who bitterly opposed registration, naturally, for it brought about a standardization under which it became more difficult for them to register.

The public has already brought about the inspection of barber shops, and it is only a question of time when they will

demand the inspection of dental offices for sanitary conditions, sterilization, etc. The dentist's office needs it far more than the barber shop ever did, for the chances for the dissemination of disease are far greater there. The standardizing of our dental nurses' training will make the handling of this proposition much easier.

The present proposed act for the registration of dental nurses, is along the same line as that for the medical nurses and is as much more restrictive, as the present dental law is more restrictive than the medical.

It would seem to be unjust and unreasonably conservative to allow institutions to have dental nurses and not the private practitioner. You might just as well say that the medical nurses should be allowed to practice only in hospitals.

Think of what the dental nurse would be to the poor. Trained for the purposes set forth in the present proposed act, she would be available for every charitable institution, mission and home where desired, and could examine, polish and dress teeth for the relief of pain. They have become a necessity in our charitable and institutional work and when the Forsythe Foundation begins operation the need will become still more imperative. Who shall say that we do not need her now and who is willing to take the responsibility of denying this great benefit to the poor? The vicissitudes of our bill remind one of the story of the old mule named Pete that fell into a well. They tried to get him out with block and tackle, but his head would strike on one side and his rear on the other. The well was so dark they could not see to shoot him and inasmuch as he had been a good, faithful mule they determined to entomb him, and all hands gathered to shovel dirt. They shoveled and shoveled and when they thought the hole was about filled up, out came Pete, walking on top of the dirt, with a most reassuring smile. Let us hope that after all our shoveling our Pete will emerge walking on top of the dirt with the same reassuring smile.

“THE DENTAL NURSE IN CANADA.”

Dr. John W. Estabrooks—Mr. President and Members of the Academy: A short time ago I was asked by the secretary to inform the society what was being done in the matter of dental

nurses in Canada. Not being able to go over the ground personally, I wrote to several of the leading dentists of Canada and made inquiries. According to their replies there is no such body of workers as yet established, though the question has been agitated. Their place seems to be occupied by the medical nurses, who apparently have more privileges there than in this country. Quoting from one of the letters: "We have nurses employed in connection with the medical and dental inspection of public school children. We have a dental inspector appointed and paid by the school board. He instructs the nurses in the matter of examining the teeth. When these examinations are made by nurses they are reported to the parents, with a request that the child's teeth be attended to."

In a letter from a dentist in Montreal, I am informed that previous to the enactment of the recent dental laws, there were a good many unregistered men who practised under the guise of dental laboratories, but no instance of abuse by the employment of such trained assistants as we wish to introduce.

This is quite significant, because it shows that in spite of there being no legal restriction, this factor was not exploited by the non-ethical men, probably because there was no profit in it. The dental nurse will not be a matter of so much financial benefit to the dentist, as it will be to the public, because it will give them a chance to have prophylactic treatment which the dentist cannot give, except at a price which is prohibitive to the general public. This will benefit the profession indirectly, in that it will educate the people to a better care of the teeth.

DISCUSSION.

Dr. Dowsley—This question is not new. A bill was introduced two years ago before the Legislature. At that time the Committee on Public Health gave leave to withdraw. The Board of Registration felt its duty was to oppose the dental nurse and has not seen the wisdom of changing its position. Personally I would like a dental nurse, but I object because it would be the most dangerous experiment that has been tried in this country. It would let down the bars and give opportunity to the advertiser and fakir. Do you know how the dental parlor is run? Have you any idea of the schemes that are worked there? Have you

any idea of the abuses that are practised daily? In conversation with one of them a while ago I asked him: "Why don't you drop this business and practise legitimately?" He said: "Life is too short. I am in this business for what I can get out of it." In days gone by I have taken out of his office and gotten convictions on not less than a dozen men. How much do you think the dental parlor should charge for a celluloid plate? Every dental parlor is supplied with a raiser, who takes the dupe and raises her from \$5 to \$25, or whatever she will stand. A short time ago a woman reported to me she had read in the papers about a certain dental parlor and applied for a set of teeth. They got a deposit and took the impression. Then they showed her a set of teeth and then raised her to \$25. After persuasion, she decided to have a gold plate and pay \$100. The next day the proprietor told her he had been talking with his artist and she should have a baked porcelain plate, and after some further persuasion she paid \$100 for a celluloid plate with plain teeth and you gentlemen wish to give that man the privilege of a dental nurse. Do you think he would restrict her to what she should do? I asked one proprietor how he furnished gold crowns for \$5. "When the patient comes in," said he, "we have a tray of crowns, but no one fits her case, which is special and requires a \$10 or \$15 crown." Dr. Potter said cleaning teeth is not classed as practising dentistry. I disagree. In Massachusetts are 3,500 registered dentists, 800 in Boston. How many really need the dental nurse? Throughout the State they tell me they do not need the dental nurse. The Board feels this proposed measure would not strengthen the law, but weaken it. The Board has gone to the State House when the law required strengthening or was too stringent. Some were instances to define practising dentistry and an amendment exempting college students and visiting clinicians and to allow practising physicians to relieve pain; also an amendment abolishing dental corporations which hitherto existed; also making it a law that only institutions having the right to give dental degrees have the right to call themselves colleges; also making the employer liable for his unregistered assistant. These and other amendments have been advertised. We have asked your co-operation and we have never received it. Once or twice when the life of the law was threatened, your co-operation was asked and no

one appeared. This agitation is simply a personal one, not in the interest of the law. I have here a slip and if it is authentic, this measure has received the endorsement of all the societies in Massachusetts. I have hardly the courage to oppose it as an individual, but I do as an officer of the State.

Dr. Barrett—I would discuss the papers, but if I am asked to discuss the act, I would think it hardly wise to show my hand at the present time. Your president has said the Board is opposed to the proposed legislation. As a member, I am opposed. Two years ago I met with some gentlemen at the office of a man who is here to-night, when the Board was asked what would be their attitude on the dental nurse. I asked what he proposed to have the dental nurse do. It was about what is stated in this bill. I said then, and think now, that it requires the highest class of skill in the dentist, to treat successfully and intelligently a case of pyorrhea. When the patients need it, they need it very much and they need the highest class of skill that can be obtained. There is no other treatment that can cause more pain if it is not intelligently done and yet you propose to transfer this to the dental nurse. You might establish the need for such services for charity work. If you can secure the services of a well trained dental nurse you could find a large field. If you could at all times handle charity patients you could find a need for the dental nurse. But where is the dental nurse in Massachusetts? I don't know of any such individual. Who is seeking this legislation, the nurse or the dentist? When the medical nurse sought registration she was an established fact, a living reality. She should be trained legitimately in accordance with the law. Where is the dental nurse? I could agree with some of the argument, particularly with Dr. Potter. I could use the dental nurse myself, but I do not think I could secure her for that purpose. If there is any way you could restrict the dental nurse to charitable purposes I would agree to do all I could, but as for the private practitioner, until further reasons are advanced, I am opposed to it as a member of the Board. There are hundreds of young men who are barely making a living. In a recent discussion I said to Dr. Potter: "How many dentists in this State are making \$3,000 a year net?" There are plenty of dentists available who have been examined and found fit to practise who are not doing

enough work to support themselves. I don't believe there has been a reason advanced, except that the busy man could have his work done at a less fee. Dr. Dowsley told you about the fakir. There are a number of other dentists who are put to their wit's end. I know of a man in Worcester who had a bridge inserted. He got hard up in Boston. A dentist took the bridge off and gave him \$2 for it. What would not such men do if they had the dental nurse to aid them? It would be simply throwing down the bars. There is no question but what you gentlemen would treat it honestly. The cream of the profession is here, but what about the hundreds of men who never have anything to do with the society work? Now you dentists are asking for the dental nurse, but as yet she does not exist.

Dr. Marvel—I am pleased to be here to-night for two reasons: First, because I honor an invitation from this particular body, and also because it is the evident desire of the Academy to hear all the phases of a proposition affecting intimately the future of the profession, before taking any formal action in regard to it. I assume that the members of the Board are asked to come here because of their official position representing in a degree, the State government. It must not be lost sight of that in asking the Legislature for additional laws, their concern will be merely in what manner the proposed bill will affect the present law, and how it will affect the people at large. Likewise, the duty of the Board as agents of the State government, is not only to protect the people by preventing poorly prepared men from practising dentistry, but is also clearly to oppose any legislation which affects the safety of the people. It seems to me, after hearing the various papers, that there is a real need for assistance in dispensary and school work and that such a clause, allowing the dental nurse to do charity work, would be a good addition to our law. This I believe would appeal to the members of the Legislature and would pass. In regard to private dental nurses, I believe it would be regarded as dangerous to the interests of the people, for the very reason that it would render inoperative and void our present law, which is regarded as a very good working instrument. When it came to asking for more salary for the Board, the Committee on Ways and Means would undoubtedly prevent its passage. Please do not misunderstand my position as

an individual dentist. Personally, I would like the services of a competent nurse to assist me in many ways, but is not the danger of filling up our towns and cities with unscrupulous dentists aided by a lot of men and women doing the actual work greater than the benefits we as ethical men would receive? I have received the views of a number of men in the small cities and I have yet to find one who believes the nurse is needed very much in his practise.

Let us move cautiously in this matter until we see what the dispensary nurse can do. Let us unite on a real practical issue and bring it to a successful conclusion. If after a time we go to our General Court and show them that the dental nurse is a real necessity, not only in charitable work, but in private practise, and that the people can be served well, only by their admittance, then they will give us what is needed.

DO WE NEED THE DENTAL NURSE?

Views of George A. Maxfield, D.D.S., member of the Massachusetts Board of Registration in Dentistry.

That a dental nurse might be more generally and profitably employed in dental offices, every one will admit, but when we come to discuss the duties of such a nurse and what they may be allowed to do, then there is a radical difference of opinion. It is only within a few years that this question has been brought before us, and while there may be some apparently favorable arguments presented to allow dental nurses to do some things that now are prohibited by our laws, I have yet to hear or read any such arguments that outweigh those against allowing any such liberty. The object in having the dental law of Massachusetts so definite in all particulars, in defining what is practising dentistry, was not simply to carry out one's theories, but because it was demonstrated in the courts of this State the necessity of all these provisions to prevent incompetent people from practising dentistry.

It was a very common plea by the defendant, in cases of prosecution for violation of the dental law, to claim they were only cleaning the teeth. It is not, therefore, a fear that this plea may be made; it is a fact that it has been made in some cases where the prosecution would have failed if, we had not

been able to prove the defendants were preparing cavities for filling, preparing teeth and roots of teeth for crowns, as well as inserting the same.

That the dental parlors, the quacks and advertisers would avail themselves of the privilege of employing dental nurses for all operations—those proposed as well as those not proposed—has already been demonstrated.

Until some means are devised whereby men and women can be made honest by the enactment of laws, then and not until then can I see how it may be possible to protect the people from incompetency if we relax in the least from the present stringency of our dental law.

The argument that the dentist could benefit many more people, if he was allowed to employ one or several dental nurses for so-called "prophylaxis treatment," "oral hygiene" and other more simple operations, does not, to my mind, carry much weight. There are undoubtedly many young people, graduates from dental colleges and also registered by the Board, that would be glad, for a small salary, to enter the offices of some of these enthusiasts for dental nurses, who might be employed to attend to these so-called simple operations. By this method, the benefit would accrue to the young practitioner and the patient could be charged the smaller fee, and then it would not be necessary to ask for any modification of our dental law.

The teaching and practise of "oral hygiene" and "prophylaxis treatment" are not simple and unimportant parts of dental practise, and should not be turned over to dental nurses; neither should the changing of dressings in the treatment of teeth, wedging of teeth, the taking of impressions, or any operation whatever in the mouth.

The practice of dentistry and that of medicine and surgery are entirely different, and that physicians and surgeons are apparently allowed a wide liberty in the employment of nurses, is not a sufficient reason why such liberty should be allowed the dentist.

Dental practise is confined to a very small and important part of the human body and it is the strict attention to the small details that makes the success of the benefit accruing to the patient. It is the skill, the trained eye to observe the minute details and the

knowledge of what the various manifestations mean, which rates the ability of the dentist to serve his patients.

Much of the duties of the medical nurse are the preparation of patients for operations, to assist by waiting upon the needs of the surgeon, to care for the instruments, sponges and other similar services. They are not to give the anesthetic, to wield the knife or scalpel, or dress the wound. They care for the patient after operations, during fevers and other illnesses, to tend to their personal needs, to watch developments, keep record of pulse and respiration, to administer medicines as per written instructions of the surgeon and physician, and only in cases of vital exigencies are they allowed to use hypodermics or to do anything that virtually are the surgeon's or physician's duties.

The duties thus specified of the medical nurse are not forbidden the dental nurse. The request for the dental nurse, however, is that they be allowed to do much more than the medical nurse is allowed to do. They are to do operations that only belong strictly to the dentist.

If a person—called a nurse if you so desire—can be taught to clean and polish the teeth, change dressings in teeth, wedge the teeth, take impressions, etc., so also they can be taught to prepare cavities, insert gold fillings and inlays; in fact, they can be taught to do all the mechanical operations the dentist is called upon to perform. Then, if the nurse is ambitious and thoroughly cleans and polishes the teeth to the satisfaction of his or her employer, why must this ambition be repressed and not be applied to other operations?

Why then, should not every individual dentist be his own judge of what the nurse can do and why should not the dentist allow the nurse to do everything he wants done?

Why is it necessary to have a board of dental examiners? If this request is granted to allow the dental nurse to do the things proposed, then the logical conclusion of the whole subject is that the whole dental law must be repealed and every person who desires to practise dentistry will be his own judge of the qualifications necessary and of his ability to fill them.

And what about the public? Is no consideration to be shown for them? A few years ago the dean of one of our foremost dental colleges said to the Massachusetts Board of Registration

in Dentistry: "Gentlemen, do your duty. Remember the public are not suffering for dentists, but are suffering from dentists."

Evidence comes to us on every hand that the same conditions exist to-day as then, and is not the time at hand when we must raise the requirements necessary to allow one to practise dentistry in this State? Can we so neglect the interests of the public by letting down the bars that the nurse employed by a few individual dentists may have more privileges than those allowed the medical nurse?

Dr. Taylor—Some years ago I appeared before the Massachusetts Legislature as a chairman of a committee. I will jog the memory of the State Board of Registration that I was instructed by the Massachusetts Dental Society and the Academy of Dental Science to appear to favor the passage of the bill opposed by Dr. Marvel. I think I did my duty by the society.

Dr. E. C. Briggs—I would like to call attention to the arguments made to-night. I will say in regard to the large number of men not getting an adequate income, this applies to the medical men. Who would use that argument to abolish the privilege of the medical and surgical nurse? Another argument was that the physician goes out to his patients, but you must remember there are a very large number of specialists who practise only in their offices. Another argument is that the nurse does not do as much as we ask for our dental nurse. Dr. Maxfield has not observed operations. The younger medical men stand around in a perfunctory way and the trained nurse gives her assistance rather than the young medical man. The medical man has this trained nurse and so should we.

Dr. Moffat—I came here with an entirely unbiased mind. At the present moment it seems to me that the Board has the best of the argument. What I have to say is largely a repetition of what Drs. Barrett and Marvel had to say. It might be well to have the opinion of Dr. Herbert Wheeler, of New York. While they needed the dental nurse, they found that she was a failure. In the first place you have got to pay them a good salary, say \$21 a week. If that is so, why not take a graduate dentist and pay her \$25. We know that the young graduate dislikes the operation of cleaning teeth. Many graduates of twenty-five years' standing cannot clean teeth properly. As far as I know there is

nothing in the present law to forbid the trained nurse working in the mouth. After three years of severe training in hospitals she is licensed to work on the body and I do not see how the mouth is excluded.

Dr. Briggs—Will the Board let us do that?

Dr. Moffatt—I think it is legal. Dr. Hardy says if we had dental nurses it would put money in our pockets. It seems to me it would be much more satisfactory to have a young graduate do this work. It seems to me there is a difference between using instruments and other acts. Personally I consider cleaning teeth is skilled work and well merits compensation. If we say to our patients we have a nurse to do this work for a smaller fee, have we not been cheating our patients by charging them as much as for other operations?

Dr. Lindstrom—I do not feel I ought to express my feelings to-night. It seems to me the Board would be very foolish to give away their ammunition. The first bill was an experiment. I am willing to bet that within a short time you will have the trained dental nurse in Massachusetts and in the United States. Four or five years ago I was interested in starting a dispensary down in Lynn. I had practised dentistry for fourteen years, but I had no idea how the children suffered from decayed teeth. Perhaps only 10 per cent. of the school children of Massachusetts ever see a dentist. The only thing we can do in the future is to prevent the fakirs coming in. A man promises to practise his profession honorably. If he afterwards does not it is the fault of human nature. In the dispensary down there I found that with the cleaning of the teeth and the washing of the mouths the children's health would go up 25 per cent. One little girl had been sick for years. After we fixed up her teeth we found that that girl instead of being sickly was healthy and her whole character was changed. The dental nurse would come if the schools offered training. They would do more good than the evil accomplished by the fakirs. I believe that the greater good for the grown-ups will be accomplished if you give the dentists some relief. If we could show the Board that there is a great need, then they ought to help us to get a good bill. It is true this would help the individual dentist, but consider this on a broader scale. Suppose you would let down the bars a little; you have not gotten rid of the fakirs

by the present dental law. Let light in. Every man sees the need of the dental nurse in institutional work. The Board is advancing, for now I find it willing to help us in institutional work. It is the biggest thing that has struck dentistry. To improve the citizenship of the State it should be legitimate.

Dr. Hunter—I am the youngest member. I am fully decided in my mind now. It seems to me that you can get all the good out of the dental nurses by confining them to the dental institutions, but I think the individual man should forego her. The dental laws were built up slowly and have done a great deal of good. I think that the Board of Registration knows better than we, the difficulties of the situation. They know what the fakirs are doing and how to combat the evils.

Dr. Brigham—Our laws are formed for the protection of the people. Does our present dental law protect the people? I think it does but slightly. The people who call for dental service are imposed upon in the extreme. Some means should be devised by which the people could be protected. I think a license should be given for five years. The chauffeur has to have his license granted from year to year. I think the dentist should have some such provision in his registration, thus taking away the evil effect.

Dr. Doubleday—It seems to me Dr. Moffatt has given a good summary. What is meant by the cleaning of the teeth has not been clearly defined. If it means scaling the teeth or treating the teeth I do not believe in allowing our assistants to do it. It takes the skilled artist to take impressions. If we get the nurse to do good work we will have to pay her. It seems to me a maid could do all we demand of the dental nurse.

Dr. Lindstrom—What would you do with the 75 per cent. of children who never see a dentist?

Dr. Doubleday—Give the child a toothbrush and pumice.

Dr. Lindstrom—Would not the child do more harm with the pumice than the nurse with a stick and prepared whiting?

Dr. Doubleday—I think no harm is ever done by pumice.

Dr. Moffatt—These young, unemployed men should educate the people to demand their services. If all the dentists will do good work there is plenty of field to cultivate in this State for those 3,500 men.

Dr. Lindstrom—I do not care for the adults, but it is my

duty to see that the children are cared for, before they are responsible for themselves. If I understand correctly, the dental law exists for the people, not for the dentists. Does the present law protect the people? Are we doing our duty by the coming generation? How many men are willing to give half a day's time? It seems to me that the men who are willing to do that for charity ought not to have their motives questioned.

Dr. Doubleday—It seems to me that the Forsythe Dental Infirmary has planned to do this work. Many men here are doing charity work in their offices.

Dr. Stanley—No legislation will change human nature. You are going to have the fakir in medicine, dentistry, blacksmithing and every trade under the sun. The time has come. You can prevent the dental nurse from doing too much work. The spirit of the age is to establish dental infirmaries. It seems to be a movement for the betterment of the conditions, but I feel you have let down the bars if the present bill goes through.

Dr. Cooke—The Board has said to-night to you gentlemen: "Your business is in danger." There is nothing in the bill about pulpless teeth. Years ago the Massachusetts Dental Society tried to get a bill through and failed. A fakir got a bill through. I worked by the side of the first president of the Board. When Dr. Dowsley was talking he went on and talked about the fakir, but what he said had nothing to do with this case. If you license a woman to serve as a dental nurse and the Board suspects she is not conducting herself properly, she could be recalled and her license not renewed. The nurse is not protected in this bill at all. You cannot stop the question of the care of children's teeth, and you know that these things have got to come. If Dr. Doubleday will take his pencil and paper and figure it out, he will find the Forsythe Dental Infirmary will not do all the work. When you come to hire men, the men are not in existence that will go around and do the work. Dr. Dowsley is wiser than he was two years ago. He is willing now to have the dental nurse in institutional work. It is not logical to have one without the other. The lawyer and the medical man were trained by preceptors and finally practised. Finally, dental teaching has evolved into the school and university. The nurse came in the same way. The nurse went out as a midwife. Finally she was trained. Take this tooth nurse and give

her a dental school training. It is necessary that we should have standardized help. I asked one of the best and cleanest practitioners in Massachusetts how he sterilized his Davis hand-piece. He evaded me. Simple boiling will not do. Boil it in soap and water and it will run properly.

To-day the health officer called at my office. I said to him: "I would like to ask you one thing. Do you ever look over the dentists and see how they conduct their offices?" How many of the 3,500 men practising in this State do it properly?

You cannot use the regular nurse. The dental nurse cannot legally examine the mouth and put in oil of cloves. In Indiana simply fitting up a dental office is considered *prima facie* evidence. If the Dental Board of Registration is willing to say that the dental profession is not far enough advanced to have the same help that the medical man has, we are at a pretty pass. To have the man who is a fakir control us, is a pretty small position to take. If the Board keeps it back it will come here last among the States. Every man here that treats children knows that we do not get them early enough. There is something radically wrong with those fellows who have not got enough to do.

Dr. Werner—I think Dr. Cooke voices the sentiment of the better class of practitioners. Is not prevention better than cure? How can we oppose it? I see the standpoint of the Board. They uphold the law, but they can never completely enforce it. The fakir should not regulate this. I am anxious for that child that Drs. Cooke and Lindstrom speak of. The work of the dental nurse will be from 75 to 90 per cent. good. I think it may be harder to enforce the law, but that should not prevent the relief of the great need for the dental nurse. In America we are the greatest law breakers. Legislation has gone to an extreme in our dental law.

Dr. Moffatt—Is it not a fact that the physician practises on any part of the body and cannot the medical nurse assist him? Answer: The law provides to what extent the registered medical man can practise on the mouth. He can relieve pain, but if he sets up an office to practise dentistry he will be violating the law. The nurse can relieve pain anywhere, but cannot practise dentistry. Relieving pain means the cleaning of the cavity, the opening of an abscess, etc.

Dr. Lindstrom—How far can the nurse go?

Dr. Taft—I wonder if the operation of cleaning the teeth is a strictly legitimate operation. Is not every woman who cleans her children's teeth violating the law? I have listened with a great deal of interest. I came with an open mind. I see truth on both sides. I am in favor of the nurse in institutions. It seems to me that the subject is a rather trivial one for legislation. There are a large number of self-respecting people in this State who would not go to a charity. It is not cheapening the cleaning of teeth. It is making the cleaning cheaper. A dentist who is going out to learn to practise cannot afford to do it. Dr. Hardy said he had a letter from Dr. Rhein saying that it was necessary that the nurse in the cleaning of teeth should not go below the gum line. I consider this cleaning of teeth just as important as inserting a gold filling.

Dr. Rogers—May I suggest that the subject be not closed because I can see glimpses of dawning intelligence? Two or three have got at this thing in a large way. This is the greatest thing that has been brought into dentistry. The accusation that we are willing to back this to fill our pockets is base. We are told that there are so many children in Massachusetts who cannot receive the dental services. The average lawyer's income is only \$700 per year. If a man is making less than \$1,000 it is his own fault. There are thousands of people in Massachusetts who are suffering from lack of service. Are we here as a lot of money getters? Are we here to serve God and humanity? That is the fundamental principle of service. If we are going to make it impossible for these thousands to be served, what reward can we expect to receive? Is there a man here who does not feel ashamed of himself to oppose this? We are unable to grow mentally because we have forced our minds to do things that a girl can do for us. Gentlemen, it is a disgrace. Here are the men that go before the Legislature and accuse us of being selfish. Look back over the history. The men who dare and sacrifice themselves for the benefit of humanity are the men whose portraits adorn the halls of fame.

Dr. Wright—I make a simple plea. Many times I wish that four hours of the day might be spared me wherein I do some of

the simple things that could be done by the dental nurse. I could use that time for advanced work.

Dr. E. H. Smith—I came here to-night with my mind not made up. I am glad I put Dr. Cooke on as chairman of the committee. I think it most unfortunate that we should come here with a spirit of antagonism to the Board. The Board has been in session and has come to the conclusion that through the fakir, this bill will affect the standing of the profession. On the other hand, there is a division of opinion on the question of institutional nurses. Does the Board deny that the nurse would be a benefit to the people in our institutions? Do they believe that the introduction of the dental nurse would be a benefit to the people? Simply because you are afraid of the fakir would you oppose an act that would benefit the people? If Massachusetts has a Board of Registration and is afraid of legislation that will benefit the people, let them send in their registration. With all due respect to the chairman, I will ask if he believes that this is an act of personal antagonism from the societies? I don't believe that Dr. Dowsley feels that way in his heart.

Look at the medical fakirs. The dental fakirs are as nothing in comparison. There is a business end to dentistry. Some one has spoken to-night of getting your young graduate. Most men who are employing associates in their offices would generally employ a promising young man just out. If a man has not gumption to make good in four or five years he is not fit to be in your office. How long is a graduate going to stay at your chair and clean teeth only?

Here are patients coming into a man's office who ought to make regular visits once a month and have their teeth properly cleansed. Unless the Board can present some better argument than that they are afraid of the fakir, it should go through.

Dr. Doubleday—I was referring to a young man graduate just out of college. There are always two sides to questions. I have had 2,500 children under my examination in the poorer districts of Cambridge. We are establishing a dental clinic in the Wellington School. What can we accomplish? What we want in the public schools are young women who have been trained who can do cement work. If you could see what we see in the schools

you would see the necessity of cleaning these mouths by young women who are prepared for it. The nurse is coming.

Dr. M. C. Smith—The school dental nurse is coming just as sure as the sun will rise to-morrow morning. Why, gentlemen, I could not get along without my school nurse. The other day a lady came in complaining of the toothache. She had a bad case of erysipelas. You have simply got to have this nurse to come between you and your patient. How about the obstetrician? Can you go from a case of erysipelas to a confinement without the protection of the nurse?

Dr. Dowsley—In answering Dr. Taft's question I would say that the court has decided that work done at home is not practising dentistry. I am glad that Dr. Taylor jogged my memory. I do remember that Dr. Taylor, as chairman of some dental society, did attend a meeting at the State House. Dr. Smith's remarks seemed to be personal. Yet we are good friends. I feel that I have not shown in my past experience that I am afraid of anything. Since the enactment of the law, between 200 and 250 prosecutions have been made, and in every instance we have had conviction. Ninety-five per cent. I have attended to personally. To get convictions you must have absolute evidence. I feel that the Board has not received the support of the dental profession. We have failed to get financial support from the State society. It has been paid out of our own pockets.

Dr. Barrett—I came here to-night as a guest, knowing that this matter was under discussion. In my remarks I repeated what was said at a conference at the Hotel Lenox. I regard the stand I have taken as in the interests of the people of the State. I have yet to hear from any one who has discussed this matter a solid reason why the dental nurse is needed in private practise. Dr. Rogers said that I had said that I would favor the nurse for the institutions. What I did say was that if the gentlemen who are here advancing this legislation, and who advocated the need of the care of the poor children's teeth, desired, I would meet with the committee to frame a law to protect the poor children and I would favor it. But I never said that I favored the institutional nurse. I neither favor nor oppose this bill as an individual. The Board and every man on it is as anxious for any legislation that will improve dentistry as any man here.

There is a difference of opinion existing among you men to-night. It is clearly your right to favor this bill. It is clearly our right to state our position. Our position is not based upon the fear of the fakir. We simply say there are complaints. We don't fear the fakir, but we say they will take advantage and there are others who will take advantage of it.

Dr. Potter—It seems to me impossible to separate the question of the institutional nurse and the private nurse.

Dr. Piper—It seems to me that the good will be far greater than the evil.

Dr. Estabrooks—The ambitious graduate will not do prophylactic work.

ADJOURNMENT

THE JOURNAL OF THE ALLIED SOCIETIES

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VOL. VII.

NEW YORK, MARCH, 1912.

No. 1.

EDITORIAL DEPARTMENT

THE BOSTON CONFERENCE

The Boston conference of the Allied Societies, reported elsewhere in this number, may be considered an auspicious event in the progress of professional journalism. The steps then taken toward concerted action in six influential societies for the maintenance and advance of our JOURNAL is direct evidence of the growing demand for such an organ of publication. Those of us who are given to the reading of signs and portents (and who is not, in one degree or other?) will note also the inspiring coincidence that this meeting was held in the old Bay State, the home of the Pilgrims, and ever the home of sturdy workers and of clear thinkers.

Good literature is the lasting proof of enlightenment in any nation or community of men. The memorials of illiterate mankind are seldom more than their bones and fighting implements; and we surmise that life with them was of the simplest. But when intelligence advanced to the complex state which produced formed language and the means of recording thought, we have not only the fact of progress, but the measure of its degree. In the literature of our times is locked up the light of our days—the unchanging picture for our children forever. The writers of any age are charged, therefore, with an important work—to make their chronicles as clear and true as may be.

It is of eminent importance that the accounts of advances in any science be made with accuracy and with a single view to scientific truth. Records of the work of men who spend their lives in relieving human suffering take high rank for their aim and for their practical value. In so meeting the needs of one department of medicine, a journal of dental science is of real value in proportion to its accuracy and excellence of form, and to its independence of any interest ulterior to its scientific aim. It is safe to assume that the men most interested in this singleness of motive and those most likely to preserve it are the members of the dental profession.

There is no hidden or invidious meaning in these words. The statement is made with a full knowledge of the fact that the most important contributions to

dental literature up to the present time have come through the media of journals owned by supply houses. This knowledge, however, does not conflict with our belief that the true proprietors of dental literature should be the men of the dental profession.

THE JOURNAL, with all proper modesty, and surely without arrogance, believes its cause to be a worthy one. In the matter of increasing its usefulness by growth and internal improvement, its managers and editors are aware of that unending need, and are using such skill as they possess in its upbuilding. They call for the patriotic support of their fellow practitioners throughout the country.

THE TAGGART DECISION

On January 3, 1912, the Taggart case, in relation to patents held by Dr. William H. Taggart covering his casting machine and his method of casting gold inlays, was argued before the Supreme Court of the District of Columbia, and on February 6 a decision was rendered sustaining the patents.¹ The defendant, Dr. George W. Boynton, has noted an appeal to the Court of Appeals.

While this decision has its due bearing upon the progress of the case, the end is not yet in view, and this famous controversy will continue for many months to excite apprehension among all concerned.

¹ See copy of Justice Clabaugh's decree and of statement by counsel for defendant, under "Current News," p. 120.

Meanwhile a certain fact should be kept in view. We are relieved from the difficult and befogging process of estimating Dr. Taggart's attitude on a basis of professional ethics (in the conventional sense of that term), since Dr. Taggart no longer practices dentistry. He has announced that he is a business man, dealing with a business proposition. He is the manufacturer of a machine, claiming certain rights under certain patents, and he is now endeavoring to establish those rights. He is making a test case by suing Dr. Boynton for infringement. The final decision depends upon the interpretation of the patent law. We trust that through the process of law the right shall prevail.

We must needs abide by the verdict of the final court; and yet, however the decision goes, there will be ground for uneasiness among many conscientious men. In the event of Dr. Taggart's victory there will be the fear of oppression through excessive prices of his machines or devices, or through other abuses made possible by the ownership of a process patent. As for dentists or manufacturers who then would find they had infringed Dr. Taggart's rights—they need scarcely expect sympathy, for they took their chance with open eyes. Still there would be uneasiness as to what Dr. Taggart, or his heirs, might do.

On the other hand, if Dr. Boynton, backed by contributions from many worthy men of the profession, should cause the annulment of Dr. Taggart's patents, we should have the comfort of the law, but, the present

writer fears, certain moral discomforts concerning Dr. Taggart. The process of casting in a mold made by a disappearing core may be done in so many ways and so simply, that his more elaborate machine would have but a small sale. And what could we then do for Taggart? Some forty thousand dentists in this country alone have used this casting method since his first demonstration, to their own substantial gain and the increased welfare of their patients. Those who do not use it fail of giving their best service to the public. What shall it matter if, on technical grounds, Taggart be found to have no claim to priority—that this method was known to the Japanese two thousand years ago? The question would remain: How many of these forty thousand men used that method before Taggart devised his machine, which reduced the problem to a working basis? There is a big indebtedness somewhere, and, like Banquo's ghost, it would come in our prosperity, to vex us.

We have before us the horns of an awkward dilemma, but it will be met and will pass into history. It is earnestly hoped that the settlement will be an equitable one. But still more important than this whole question is one which it suggests: How may we in future so adjust our laws, and our views governing honorable conduct in professional life, that men may feel encouraged to invent useful instruments or devices, and in such wise that both parties, the inventor and those who use the device, may enjoy mutual benefit,

security and peace of mind? The first duty of the most altruistic man is self-support. He must carry his own weight. He must be just before he is generous. To expect any man to spend years, and to jeopardize his means of livelihood in the perfecting of any public utility, as a free gift, is upon its face preposterous. The adjustment suggested, if possible, would carry us a little nearer to the millenium.

NOTE—The signature of the leading article in the December JOURNAL should be Dr. *Waldo* E. Boardman instead of Dr. Walter E. Boardman, a proof reader's error, which the JOURNAL exceedingly regrets.

CURRENT NEWS.

Copy.

SUPREME COURT OF THE DISTRICT OF COLUMBIA.

WILLIAM H. TAGGART	}	In Equity, No. 27,927.
vs.		
GEORGE W. BOYNTON		

DECREE.

This cause having come on to be heard on the pleadings and proofs, and the court having heard the argument of RUSSELL WILES, ESQ., and FRANCIS M. PHELPS, ESQ., on behalf of the plaintiff and of E. T. FENWICK, ESQ., and L. L. MORRILL, ESQ., on behalf of defendant, and being fully advised in the premises finds as follows:

1. WILLIAM H. TAGGART, the plaintiff herein, is the owner of Letters Patent of the United States, No. 872,978, for a Method for Making Molds for Dental Inlays and the Like.

2. Said Taggart was the first, sole and original inventor of said method and said method involves patentable invention over the prior art. It was not known or used by others before plaintiff's invention thereof or more than two years prior to January 12, 1907, and the defenses of prior knowledge and use, and of public use more than two years before the filing of the application are not established and are overruled.

3. Letters Patent of the United States, No. 872,978, are therefore good and valid in law as to each claim thereof.

4. Defendant, Dr. Geo. W. Boynton, has infringed said patent by practising the process thereof in the District of Columbia since the grant of the patent and prior to the filing of the bill herein.

5. Plaintiff has not prayed for damages in his bill and has limited his prayer to that for an injunction and general relief.

IT IS THEREFORE ORDERED, ADJUDGED AND DECREED, That defendant, George W. Boynton, his agents, servants, attorneys and workmen be and hereby are enjoined from further infringing said patent and from further practising the method thereof, or

any material or substantial part thereof, and that a writ of injunction to this effect issue out of this court.

FURTHER ORDERED, That defendant pay the costs of this suit to be taxed by the Clerk and plaintiff have execution therefor.

HARRY M. CLABAUGH,
Chief Justice.

Approved as to form.

FRANCIS M. PHELPS.

Dyrenforth, Lee, Chritton & Wiles,

Of Counsel for Plaintiff.

Edward T. Fenwick,

Of Counsel for Defendant.

A true copy.

Test:

J. R. YOUNG, Clerk.

By *F. E. Cunningham,*

Asst. Clerk.

(Seal)

Copy.

WASHINGTON, D. C., February 10, 1912.

Dr. George W. Boynton yesterday noted an appeal to the Court of Appeals in the Taggart case, and filed a supersedeas bond required by the rules of the court.

The court has issued no injunction or restraining order restraining Dr. Boynton or any other dentist from practising the inlay process upon which he was sued, nor can any such order be issued until the final hearing of the case before the Court of Appeals. It will be at least three or four months before this case will be heard by the Court of Appeals and finally decided.

As both sides to this controversy had stated to the Court that an appeal would be taken if the decision were adverse, the lower court did not consider it necessary in its decision to go into the question of the evidence taken by both sides, but simply announced from the bench that he had decided in favor of sustaining the patent.

FRED B. RHODES,
Attorney for Defendant.

DINNER IN HONOR OF DR. W. W. WALKER

A dinner was given in honor of Dr. William Wallace Walker on January 20th, 1912, at the Hotel Astor, New York City. Dr. Walker's friends, represented by the profession at large, under the auspices of the First District Dental Society, S. N. Y., made this occasion a memorable one. About three hundred diners joined in appreciation of Dr. Walker's splendid work in recently bringing about the consolidation of the New York Societies. Through his leadership and the co-operation of the members of the Societies so brought together, the First District Society now stands in the front rank among the most efficient and important dental associations in this country.

The sad absence of Dr. Perry was felt by every one. He had been Chairman of the Dinner Committee, and his personality was seen in all the preparations for this tribute to his friend. But, in deference to what all present knew would have been Dr. Perry's most earnest desire, no untimely melancholy was permitted to dull the bright meeting of those in whose memory he stands beloved.

Dr. Ottolengui, as Toastmaster, made an excellent opening address, and then called upon the Rev. R. W. McLaughlin, Drs. Wm. Jarvie, B. Holly Smith, Edwin T. Darby, Wendell Phillips, Truman W. Brophy, Hart J. Goslee, and Mr. Frank Lawrence, President of the Lotus Club, who responded in praise of Dr. Walker's work, and more particularly those personal qualities which had brought together Dr. Walker's many friends.

Dr. Walker was almost overwhelmed by magnificent gifts from those attending, and many others who could not be present. He, however, showed his ability to meet the situation in a graceful reply. Dr. J. F. P. Hodson, then in Redlands, California, had sent a message that at a certain hour he would drink Dr. Walker's health simultaneously with those in New York. At the proper moment all arose, and the guest of the evening was greeted by this transcontinental pledge to his good health and happiness.

IN MEMORIAM.

HORATIO COOK MERIAM, D.M.D.

Horatio Cook Meriam was born in Tewksbury, Mass., March 20, 1849. His father, of the same name, was born in Concord, Mass., in the house at Meriam's Corner, of Revolutionary fame. The senior was by profession a lawyer, and was for a time assessor of the port of Boston. He was a man of literary tastes, and wrote important articles for periodicals. Dr. Meriam's mother was Esther Lewis, of Canton, Mass. The families of both father and mother came to this country from County Kent, England.

Dr. Meriam's early education was principally in the district school in Tewksbury. Later he had a little time in a school in Lowell; but he always said that in his boyhood his best training came directly from his father.

Dr. Meriam first entered the Harvard Dental School in 1870. After one year's attendance he was out for two years; returned in the autumn of 1873, and graduated in 1874. He gained dental knowledge also in several private offices in which he had pupilage or employment, including that of Dr. J. H. Batchelder, of Salem, and perhaps previously that of Dr. G. A. Gerry, of Lowell. Dr. Meriam was clinical instructor in operative dentistry in the Harvard Dental School in 1884-5, and instructor in operative dentistry from 1885 to 1889.

Dr. Meriam was a member of many organizations, in all of which he was a worker. In most of the local societies he had held many offices, including the presidency. Among the dental societies to which he belonged are the Lynn Dental Society, the Harvard Dental Alumni Association, the Massachusetts Dental Society, the American Academy of Dental Science, and the New York Institute of Stomatology. Dr. Meriam was first made an Active Fellow of the Academy in 1881. He was librarian from 1881 to 1888, vice-president in 1908-9, president in 1909 and 1910. He was one of the few dentists of the United States to be elected to honorary membership in the Odontological Society of Great Britain.

Among organizations other than dental in which Dr. Meriam had membership are the Essex Institute, the Essex County Association, the Massachusetts Horticultural Society, and the Massachusetts Reform Club. These show his interest in science, in the cultivation of flowers and fruits, and in good citizenship.

Dr. Meriam married September 12, 1878, Miss Edith Worcester, of Salem. They had five sons, the fourth, bearing his name, is now studying to follow his father's profession. Dr. Meriam died August 11, 1911, in the sixty-third year of his age.

Dr. Meriam was a man of very large ability as a dentist. He was ingenious, and he devised numerous appliances, materials and ways of operating for the benefit of his patients. He was large hearted and generous. He freely gave in cordial helpfulness to others what he had attained. In nothing was he happier than in helping others. He had rare literary taste and acquaintance, and in his speaking he commanded a wealth of appropriate quotation. His whole life was industrious, earnest, faithful, clean, upright, Christian. We mourn that he is to be with us no more; we tender our cordial sympathy to his family, and we inscribe on our records this testimonial to his worth.

(Signed)

CHARLES A. BRACKETT,
ROBERT R. ANDREWS,
EDWARD C. BRIGGS,

Committee.

AMERICAN ACADEMY OF DENTAL SCIENCE.

BOSTON, MASS., Dec. 6, 1911.

MEMORIAL TO DR. HORATIO COOK MERIAM*

Horatio Cook Meriam, D.M.D., was born in Tewksbury, Mass., March 20, 1849; died August 11, 1911, at Salem, Mass. Dr. Meriam came from an old New England Puritan family which settled in Massachusetts Colony at Concord in 1638. Meriam's Corner, about a mile from the center of the town of Concord, is of Revolutionary fame, for here Joseph Meriam, his first ancestor, settled and became a prominent man in the town's affairs; was the first representative from Concord to the General Court of Massachusetts. Dr. Meriam's father was the last of the family to leave Meriam's Corner and the town of Concord. His great uncle, Ebenezer Meriam, of Concord, was a distinguished scientist, statistician and meteorologist, large means enabling him to give himself up to these scientific pursuits without pecuniary compensation, and Ebenezer Meriam was the originator of the theory of cycles of atmospheric phenomena, from which has been developed our United States Weather Bureau. It was he who, with his three clerks, kept an accurate scientific record of the thermometer and barometer for over thirty years, the like of which no other man did up to that time in our country.

He made over 2000 communications to the *New York Journal of Commerce* and was in 1841 publisher of the *Municipal Gazetteer*, an historical and scientific magazine. There are many other ancestors of Dr. Meriam who were notable men as teachers, mechanics, lawyers, college professors, physicians and naval and military commanders.

Dr. Meriam's father, Horatio Cook Meriam, A.B., A.M., L.L.B., was a classmate in the famous Harvard class of 1829 with Oliver Wendell Holmes, James Freeman Clarke, etc.; was an educator, lawyer and scientific agriculturist, and in 1842 to 1843 was editor of the *Boston Cultivator*. He took great interest in the establishing of the Massachusetts Agricultural College at Amherst, was a liberal contributor to the agricultural press on all scientific facts pertaining to stock, fruits and vegetables; was an authority in all questions of tariff and general knowledge; a fluent, interesting speaker, and a man of great force of

* Read at Metropolitan District Dental Society, Dec. 11, 1911.

character and mentality, and was in advance of the day in his thoughts and opinions, and, as Dr. Nathan Allen, of Lowell, wrote, "I wish we had more of such men."

Into such a home our friend, Dr. Meriam, was born, the youngest child of nine. From his early childhood his father's study and library was his schoolroom, his father his teacher and tutor. Only at irregular times did he attend the Tewksbury public school and the academy, for schoolroom, academy or college were not to his liking in his early youth. He loved books, loved to read, and did recite regularly to his father, and showed a very retentive mind to anything he read, heard or saw, but the confinement of a schoolroom was much against his wish. The workshop, the laboratory and God's out-of-doors were ever interesting to him. At the outbreak of the Civil War his older and only other living brother, John Welles Meriam, entered the service of his country and on the march from New Orleans to Memphis was taken sick and died. This left Dr. Meriam the only son in his father's family, and at the age of twenty years he chose dentistry as his profession and entered as a student the office of Dr. Gustavius A. Gerry, of Lowell, Mass., where he remained for one year. The following year, in 1870 to 1871, he attended the Harvard Dental School, and having become quite proficient in laboratory work as well as in operative dentistry, he accepted for two years a position as assistant in the office of Dr. John H. Batchelder, of Salem, Mass., when, in 1873, he for the second time entered Harvard Dental School, graduating in the class of 1874. Those who were with him at the school remember him as one of the best attending and most studious workers; one ever ready and alert to grasp the minute details of every subject. Written examinations and a high standard of requirements were no obstacles to him, but rather a high incentive. He was generally in the front ranks at the opening morning lecture and one of the last to leave the infirmary at the end of the day's work. In the autumn of 1874 he opened his office in Salem, where he successfully practiced his calling for thirty-seven consecutive years. When twenty-nine years old he married Edith Worcester, the daughter of the Rev. Dr. Sam'l H. Worcester, a theologian as well as medical practitioner. During their thirty-three years of happy matrimonial life five sons were born to them, the second

youngest of whom is now a student at Harvard Dental School. To the faithful wife and mother great credit is due, for her help and her ability were of immense value to Dr. Meriam in every way. He was a member and ex-president of the Harvard Dental Alumni Association, the Harvard Odontological Society, the Massachusetts Dental Society, the American Academy of Dental Science; was an associate member of the New York Institute of Stomatology and an honorary member of the Odontological Society of Great Britain. In all these different societies he was an active and regular attendant; in their deliberations he was a conspicuous and fluent rhetorical speaker, his fine memory and good vocabulary aiding him at all occasions; amongst us he stood as the foremost advocate for ethical advance and improvement and independent professional journalism, for the elevation and respect of our profession was ever uppermost in his heart and mind. He was also a prolific contributor to our literature; some of his essays are models of high professional advocacy, as, for instance, his paper on "Professional Atmosphere and Morals," read before the New York Odontological Society in 1889, or his "Footprints of a Profession," read before the Maine Dental Society, or the last paper that he wrote and read before our Massachusetts Dental Society, namely, "The Society's Obligations to the State, the Community and the Members of the Profession." But not only on the ethical, but also on the practical side, was he a leader and teacher, his papers on "Gutta Percha," on "Meriam Files," on "Compound Fillings," on "Meriam Removable Bridge" and on "Some Uses of English Tube Teeth" being examples. In all these writings he shows us a wide mental horizon and a manipulative dexterity. Honest, truthful, ethical, upright, generous, optimistic, resourceful and ever ready to teach and impart to others that which would be of help and benefit were his characteristics and his make-up.

Besides his profession he had many other subjects that interested him and gave him diversion in mind and body. He loved all of God's out-of-doors, particularly flowers and their cultivation; was active in the town's affairs; interested in all historical, genealogical and scientific facts; the general drift of our civilization; the economic questions as effected by trusts, tariff, machinery and production, all were things on which he had read

and could discuss in a very unusual manner. He was in all things broad. The ego, the nostrum, were not his total; the all, the what is best for the many, were much more to his liking.

Harvard University Dental School appointed him as a clinical instructor in operative dentistry in 1884-1885 and as an instructor in operative dentistry from 1885 to 1889. In his thirty-seven years of dental practice he was more than ordinarily successful, had a large practice, and a wide circle of acquaintances and friends, and enjoyed an unusual degree of health and ability to work. In his laboratory he did considerable investigating and experimenting and was very dextrous in making appliances and new instruments, and it is needless to say he did not patent any of them, for patents in medicine or dentistry were not his conception of professional ethics.

In December, 1908, came his first serious sickness, an attack of angina pectoris, from which he made a fairly good recovery, leaving him, however, with a lesion of the heart's function. On Sunday, June 11, 1911, while at Greenwood and in the garden of his farm, he was stricken with a second and more serious attack, from which he never fully recovered. From July 1 he was confined to his room and bed and shortly after midnight, August 11, the end came, peacefully and quietly. The funeral was held from Grace Church, Salem, Mass., Sunday, August 13, and his remains lie at rest in the family plot at Lowell, Mass.

In the death of Dr. Meriam this society and our profession have lost a very able, ethical and distinguished member, whose life and example have been full of uplifting influence to our profession, for he was a strong pillar among us; a guide and honored brother, whose voice was ever listened to with respectful attention. Therefore, be it

Resolved, That this memorial be entered upon the records of this society and a copy be forwarded to his bereaved family.

JULIUS G. W. WERNER,
Committee.

Henry

DR. SAFFORD GOODWIN PERRY

TO THE OFFICERS AND MEMBERS OF THE FIRST DISTRICT DENTAL
SOCIETY OF THE STATE OF NEW YORK:

Gentlemen:

The committee appointed to prepare a minute upon the death of our dearly beloved and former member, Dr. S. G. Perry, would report as follows:

Died at his home in New York, on Friday, December 22, 1911, Dr. Safford Goodwin Perry, in the sixty-eighth year of his age.

Dr. Perry was born at Wilton, Saratoga County, in this State, October 29, 1843, and received his education in the schools of his native town, in which he afterwards taught for one or two winters. In 1863 he matriculated in the Pennsylvania College of Dental Surgery, graduating from that institution on February 25, 1865. Immediately afterwards he associated himself with his cousin, Dr. George W. Perry, and commenced to practise in Yonkers. Here he remained for two years, and then removed his office to New York, where he continued the practise of his profession up to the time of his death. His first address in New York was 111 Madison avenue.

Dr. Perry was one of the most active members of our profession and profoundly interested in everything which pertained to its advancement and increased efficiency. He was one of the oldest members of the N. Y. Odontological Society, and continued prominent in all its activities until its merger into this society, of which he was one of the organizers, and much of its present great usefulness is due to his good judgment, wise counsel and his never failing interest and constant efforts in its behalf. He was also a faithful member of the Dental Society of the State of New York, and his ever-welcome presence at its meetings always added interest and value to the proceedings. He was a valued member of the National Dental Association, and at its meeting at Cleveland, Ohio, last July, he read one of the ablest and most favorably received papers presented. He had also been deeply interested in the four International Dental Congresses which have been held, two of them in Europe and two in this

country, and had been an active and valued participator in their proceedings. He was also an active and valued member of Psi Omega, and was very much interested in its younger members and in everything which pertained to the welfare and influence of that fraternity.

Dr. Perry originated and presented to the profession many instruments and devices which to-day enable the dentist to render better and more effective service to his patients than he could possibly do without such aid. Witness the "Perry Separators," "Perry-Howland crowns," "Perry's set of excavators," "Perry's System of filling root canals," and numerous other devices and methods which might be mentioned. He was a frequent and valuable contributor to the literature of our profession. The literary merit of his papers was of the very highest order, and they were always listened to with close attention, for the subjects not only were of general interest and practical value, but always presented in a masterly and convincing manner.

Dr. Perry was one of the most talented men in the dental profession. He had literary ability of no mean order. He was a poet and it had often been a work of love to put into poetry his sentiments regarding some dear friend. He was a true lover of art as the many beautiful pictures hanging upon the walls of his home will testify. He not only loved music but he was a musician and a skillful player upon the violin. He loved the country and brought to the development of his country home at Washington, Conn., with its fruit and ornamental trees, its flowers and its lawns, a knowledge of such things as is rarely vouchsafed to the city man.

Dr. Perry was one of the best beloved men in the dental profession. He was gentle in his manner and sympathetic in his nature. No one ever went to him for sympathy or help and went away empty-handed. To the young practitioner he was always cordial and helpful, and many of them have been encouraged by his advice and assistance to put forth renewed efforts to get a foothold upon the professional ladder. To those older he was a genial and delightful companion and a steadfast friend ever. He was one of nature's noblemen; of handsome mien, refined and winsome in his manner and of pleasing address, his whole personality was most attractive. Added to all these, he had to an

unusual degree that which he so admired in others and which he so often designated as "heart quality." Imbued to a high degree with a sense of the usefulness and dignity of his profession, he practised it with gentleness, consideration, ability and honesty. Carrying these qualities into his daily intercourse with his patients and all of those with whom he came in contact, he had endeared himself to a large and influential clientele, and done much to influence and raise the standard with which the community regards the ethical, social and professional standing of the dentist.

In the death of Dr. Perry the dental profession has suffered a great loss. This society will sadly miss him at its meetings and in its councils, and every member will feel he has lost a true and loyal friend.

The First District Dental Society of the State of New York in the sorrow of its own loss would not lose sight of the sad bereavement of the family of our dear departed friend, and it tenders to the widow and two daughters of Dr. Perry the sincere and profound sympathy of its members.

Resolved, That this minute be spread in full upon the record book of the society, and an engrossed copy of it, signed by the proper officers and the committee, be sent to Mrs. Perry.

Committee.

(signed) WILLIAM JARVIE.

FEBRUARY 5, 1912.

MASSACHUSETTS DENTAL SOCIETY**LAW COMMITTEE.***Notice.*

To facilitate investigation in connection with our proposed protection of members against unjust suits for mal-practise we respectfully solicit from society members and the profession at large statistics regarding suits or threatened suits for mal-practise, including claims of the plaintiff, amount of indemnity, nature of injuries claimed, manner of settlement, legal and other costs, and any other details which will aid us in tabulating a list of cases for reference.

All communications will be considered confidential, and no names will be inserted in our statistical records.

The prevalence of this system of extortion is well appreciated by the profession, and we believe that the members of the society will give us their aid and support in our endeavors to stamp out the evil. We need statistics on which to base our future plans, and these we can best secure from individual members of the profession, who have had mal-practise threats or suits.

The committee will appreciate all communications bearing upon the subject. Address,

EDWIN N. KENT, Chairman,
222 Washington Street, Brookline, Mass.

THE NATIONAL DENTAL PROTECTIVE ASSOCIATION

WASHINGTON, D. C., March 6, 1912.

The annual meeting of the National Dental Protective Association will be held at the Fredonia Hotel, Washington, D. C., May 21, 1912, at 7.30 P.M., for the election of Trustees, and the transaction of business.

RICHARD SUMMA, President.

M. F. FINLEY, Secretary.

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A WORD OF CAUTION

If I were to preach a sermon to an audience of dentists I should be tempted to choose for my subject, "The Blessings of Frivolity." It does not sound like an improving subject, nor one calculated to inculcate in the professional mind high ideals and progressive action. It is, however, just possible that in our earnest concentration looking toward better skill, better methods and better results, we may be neglecting some harmless amusements that belong to a well-rounded life, and may be depriving ourselves of a reasonable degree of contentment and happiness.

For us, who enjoy the privilege of practising dentistry, life possesses an absorbing interest. The joy which results from skillful labor belongs to us, and the supreme satisfaction of contributing to the comfort and health of mankind is our reward. We have our share of unpleasant tasks and these must be approached with genuine courage and carried through with integrity and skill, for it takes backbone and character to practise dentistry. The man of weak moral fibre chooses the wrong profession when he begins the study of dentistry. Honesty and determination, together with a high degree of vital force, enter into the construction of a good filling, and are essential to the success of all dental operations. Skill alone is insufficient.

Successful accomplishment has thus far marked the advance of dental practise, and, intoxicated by success, we are striving with ferocious eagerness for greater results. The pressure is so fierce and so constant that it threatens to impair our health and curtail our usefulness, and we who daily preach the conservation of human life and proclaim the need of rest, fresh air, and wholesome recreation, are in grave danger of breaking down, because we deprive ourselves of these safeguards to health. The temptation is very great at this crowded period of the year to accept more work than can be accomplished without risk to health. With the long hours of daylight comes the temptation of longer hours of labor. The income increases, but the work suffers; for the best work can never be done under the pressure of limited time, nor by a body wearied by overwork. Failures, concealed or frankly admitted, come usually from lack of time, lack of preparation, or lack of strength. Hence, my plea for frivolity. Not in any debased sense, but meaning the joyousness of life. No one can look upon a body of dentists without being impressed by their earnest, serious demeanor, and it is this seriousness more than the need or desire of a larger income, that leads to overwork.

Men differ in their capacity for work. I know a man of a good New England farmer stock who for many years has begun his work at half-past eight in the morning and continued it until half-past five or six at night. He is still alive, and his inherited strength may stave off physical disaster—but he has lost his life. He has never learned to play any wholesome outdoor game. He cannot ride a horse, row a boat, or cast a fly. His eyes have been too tired for study or for the reading of entertaining books. He has never contributed to dental literature, and has rarely been seen at a dental society meeting. His weary brain could never suggest a merry jest or hold its own in brilliant company; and now when youth is passed and the evening shadows begin to temper the sun-

set glow he meditates on the passing day, and finds no satisfying memories with which to bless his old age. He has a fortune, but has failed to develop a single interest or pleasure with which to occupy his declining years. I have in mind another man who early realized the limitations of a feeble body. With unusual foresight he adjusted his practise to his strength, and as his practise grew, he passed on to his associates and friends the patients he could not care for. In the four or five hours he devoted to practise he gave his patients unsurpassed skill and judgment, and gloried in the excellence of his work. He had time for serious study and, as he interested himself actively in every progressive professional movement, he made valuable contributions to the science and literature of dentistry. Appreciating the value of fresh air and exercise he became an adept in many wholesome outdoor sports and succeeded in building up a strong body. Play was to him never undignified, nor frivolity wicked, and you could frequently see him with three or four children, and perhaps his wife, sitting in the grandstand watching a football or a baseball game and cheering with the enthusiasm of a school boy. He surrounded himself with brilliant companions and kindly friends. He was helpful to the young men in his profession. His interest in the welfare of the poor was wise and generous, and now as he approaches his last milestone he has no fear, for every step is blessed by the gratitude and love of those whom he has helped, and he has the satisfaction of feeling that the world is better because he has lived.

Most of us are working too hard, and the work is of such a nature that it lowers our brain and nerve forces. An overcrowded day too often means a lowering of the standard of our work. It means a mind unfit for social intercourse, a body too weary for wholesome sport, and possibly a recourse to alcoholic stimulants to stir up the tired functions so shamefully abused.

Fun, frivolity, wholesome sport, jollity, all help us to avoid becoming self-centered and selfish, all promote generous impulses and, above all, stimulate a kindlier professional spirit.

If we stand with our backs to the crowded city of accomplishment and with shaded eyes gaze out into still uncultivated fields, we are able to descry the shadowy outlines of new thoughts and new discoveries; but nothing seems so gracious of promise as the outline we seem to discern of a beautiful new professionalism in the spread of which the dream of to-day will become the concrete reality of to-morrow.

SAMUEL A. HOPKINS.

**TRIGEMINAL NEURALGIA FROM THE STANDPOINT
OF THE NEUROLOGIST¹**

BY EDWARD W. TAYLOR, M. D.

The subject of this paper is trigeminal neuralgia from the standpoint of the neurologist. I regret somewhat that another speaker was not also appointed from your ranks who would discuss the subject from the viewpoint of the dentist; inasmuch as it is a subject in which we are equally interested; and, so far as I am able to observe, we physicians have as much to learn from you in regard to this elusive affection as you have from us. Possibly, however, looking at the matter from the somewhat broader standpoint of the physician, I may be able to point out some of our difficulties and some of the situations in which we ought to come much closer together than we ordinarily do in the attempt to arrive at definite conclusions regarding our patients.

For many years, in the instruction which I have been fortunate enough to give at the Harvard Dental School, and also in a talk which I was allowed to give before this Association some six or seven years ago, I have tried to bring out the proper relation between the dentist and the physician. In my experience, it is rare that we physicians are called in consultation by dentists, and perhaps equally so that we call upon the members of your profession in connection with cases which are of common interest. There should in the future be a change in this regard, with an increasing liberality in consultation. I am very sure it would conduce greatly to the benefit of the patient, and especially in this very difficult subject of trigeminal neuralgia, in which the etiology is often so difficult to elucidate.

Now a word in regard to pain in general: Pain is the one thing in life which must be absolutely relieved; in which the demand is imperative on the part of the patient. We can bear wasting disease and inevitable fatalities from one condition or another, but pain the ordinary patient absolutely refuses to stand. This element of pain is most extraordinarily exemplified in this affec-

¹ Read before The American Academy of Dental Science, Boston, Feb. 7, 1912. See discussion, page 228.

tion which we term neuralgia; and in no other form of neuralgia, I am inclined to think, is the pain so severe as it is in the neuralgia of the fifth nerve. It is always necessary for us to estimate the significance of pain so far as we are able; to put the manifestation of pain in its proper category. When a patient presents himself to you it is one of your paramount duties to determine with such means as you may have at your disposal the degree of pain which the patient actually suffers. You doubtless make mistakes in that determination, as we all do, because pain after all depends in considerable measure upon the attitude of the patient, and may in this sense be regarded as purely a subjective phenomenon. It is impossible to understand the nature of pain in contrast to various disturbances in the motor sphere. The interpretation of pain therefore becomes one of the most subtle and difficult tasks we have before us. I look back with chagrin to certain experiences I have had. One case I recall in which a patient complained bitterly of pain and repeatedly demanded pain-stilling drugs, which were refused partly at the wish of the family and partly because the degree of pain was misinterpreted. Although it was recognized that the disease from which she suffered was presumably a fatal one, such drugs were not used on the ground that she must be exaggerating her suffering. An autopsy in that case disclosed a tumor of the spinal cord, so situated that one could hardly conceive of any condition that would cause more excruciating pain. We are constantly making such mistakes.

To return to our subject of trigeminal neuralgia, our first duty is to determine how much our patients are suffering. The decision in any given case is an extremely difficult matter, and one in which we need all the help you can give us; and I also believe that you need all the help which we possibly may be able to give you.

With regard to the etiology of trigeminal neuralgia, Starr, of New York, and others have collected statistics which show that neuralgia of the fifth nerve is by all means the most common variety; the next being pain in the distribution of the sciatic nerve. Other observers, interpreting their findings in a somewhat different way, have found that sciatica was the more common. The matter of importance is that the trigeminal nerve is peculiarly

prone to pain. The reason for this is not definitely determined, but may, on theoretical grounds, be regarded as due presumably to the fact of its complicated and highly differentiated character, together with its passage through small apertures in the skull and final termination in bony structures like the teeth. All these conditions are such as to give rise to the possibility of pressure, and pressure we know to be a prolific cause of irritation and pain. In this connection it is interesting to note that the commonest type of motor paralysis is that of the facial nerve.

Approaching the matter now from a practical standpoint, given pain in one or another branch of the nerve, how are we to proceed in our attempt to diagnosticate the cause? When I say "We," I include all of us in this situation, because it seems to me that the cases come to you fully as often as to the physician, and it is just as essential for you to determine the probability of the etiology as it is for us to do so. The mental process that we ordinarily go through in a case of neuralgia of this nerve is to determine, in the first place, what the arterial condition of the patient may be. It is desirable to take the blood pressure to determine if possible whether structural disease of other organs is present—notably of the kidneys. A urinary examination should also be made to determine among other things the presence or absence of diabetes. These are investigations which I am aware are not ordinarily made by men in your branch of the profession. This I regard as a mistake. If you are dealing with the subject of trigeminal neuralgia which frequently results from structural disease of other organs, that fact ought to be definitely determined before any drastic attempt is made at relief. The condition of the arterial system is doubtless of great importance, particularly in the senile forms of neuralgia, often characterized by the typical *douloureux*. In those cases which come on in the later decades of life—often in very old persons—arterial changes are almost inevitable. The exact relation of these changes to pain is a matter which we cannot say anything definite about. We do not know how the arterial change produces pain, but are forced to the assumption from much experience that such is the case. We may, with justice, assume that the perfect function of a nerve demands a perfect blood supply. If this blood supply is disturbed, a sensory nerve may manifest its disturbance by the expression of

pain. Neuralgia has, in fact, been described somewhat fancifully as "the cry of the nerve for more blood," implying that the nourishment of the nerve is the essential feature of its normal activities. Arteriosclerotic changes in the neighborhood of the Gasserian ganglion have been described by Spiller, Putnam, and others, and the relationship between these changes and the pain have been assumed to be cause and effect. In the extirpation of the Gasserian ganglion by operative means, it should be remembered that the structure of the ganglion is of necessity damaged and that particular care should be therefore taken in the interpretations of lesions found in it.

A second condition which should be investigated, is the possibility of new growth or bony exostoses at the foramina of exit of the nerve. These conditions may be determined to a certain degree by X-ray. On the whole, actual pressure on the nerve is an unusual cause of neuralgia, but it must not be forgotten for this reason that tumor, leading as it inevitably does to pressure, is a peculiarly prolific cause of pain. A matter which is of great importance in our routine examination of these cases is the question of disease of the antra and of the frontal sinuses. Methods of transillumination of late perfected by phrenologists permit of the determination of inflammatory exudates in these cavities. Other nasal conditions, catarrh, coryza, or any of the possibilities of inflammation in and about the nasal cavities or the accessory sinuses of the nose, should be carefully eliminated before a diagnosis of other causes is made.

In regard to the teeth, which perhaps interest you, as it certainly interests me as much as any part of the subject, our statistics are vague. It is generally supposed that the teeth are a prolific cause of neuralgia in the distribution of the fifth nerve, and particularly in its lower branches. Some observers feel very strongly that the teeth are responsible in by far the greater number of cases. Others, and I am inclined to include myself in this group, feel that the teeth are more often held responsible than the actual facts justify. We cannot, in many cases, be dogmatic regarding the relationship between the nerve and the teeth antecedent to operative interference. The fact remains that the teeth are very frequently responsible and often in ways not outwardly obvious. It is unnecessary and quite beyond my knowledge to

speak in detail of the various defects of the teeth possibly productive of neuralgia. I make mention merely of the introduction of the X-ray, which seems to have helped greatly in the determination of certain disturbances. A few days ago I was talking with a physician who was exuberant because a patient who had had all sorts of operations done for the relief of neuralgia, finally by resort to an X-ray found an impacted wisdom tooth, the removal of which immediately relieved the situation. The condition did not show externally in the least, but the X-ray revealed a tooth with extraordinarily long roots and in such a position that the nerve presumably was suffering.

The entrance into the teeth of the filaments of the trigeminal nerve is of much anatomical interest. The method of penetration of these filaments through the roots of the teeth into the pulp cavity constitutes a situation, which certainly is prolific of possibilities of pain. It is not by any means always the obvious disturbance in a tooth which is the cause of the trouble. Naturally a cavity should be filled, but I presume—and I trust the discussion later will bring out some of these points—that the difficulty in these cases very frequently does not arise from such obvious defects, but rather from disturbance at the point of entrance of nerve filaments into the root. Dr. George L. Walton at one time collected a series of specimens illustrating exostoses on the roots of the teeth, which might well be the source of disturbance. He also, through the kindness of his dental friends, collected a large number of pulp stones, many taken from apparently normal teeth, in connection with his study of trigeminal neuralgia.

Another point I would make is this—I do not see theoretically why the extraction of a tooth, even of an offending tooth, should cure necessarily the neuralgia attributed to it. It is a common experience—fortunately, however, less frequent now than in years past—to see patients complaining of neuralgia in the second or third division of the nerve, who have lost many or perhaps all of their teeth through extraction, and yet with a persistence of the pain. From what is known of nerve regeneration, it is fair to assume that mere extraction of a tooth can never insure the cessation of pain, for the reason that the extraction of a tooth, violently as it may rupture the nerve going to it, still leaves intact the proximal end. Extraction, no doubt, is much more beneficial than

it otherwise would be from the fact that the nerve is violently torn rather than neatly cut. Nerves injured in this way are, of course, less likely to regenerate quickly than if they were treated with greater consideration. The fact remains that the very extraordinary capacity of regeneration of peripheral nerves must always be borne in mind. The dictum that a nerve once damaged tends to regenerate cannot be too much insisted upon. There is no reason, so far as I can see, why the nerves in the alveolar processes should not regenerate as they do everywhere else and lead to a recurrence of pain.

In operations on nerves in general, or to take a common example, after amputation, the surgeon strives to cut the nerve as far back as possible in order to overcome, as far as may be, the tendency toward regeneration. The so-called painful stump after amputation is due to the outgrowth of the nerve against resistance, the formation of sensitive enlargements—so-called neuromata—which constitute a constant source of extreme annoyance, if not of actual suffering, to the patient. This condition may be so highly developed that patients remain conscious of the presence of the amputated limb through the referred sensations caused by pressure of the outgrowing nerve at the point of amputation. I have not seen it mentioned and I do not know how much attention you may have given to it, but I should suppose that something like this might happen after the extraction of a tooth. The recurrence of pain when the tooth has been removed is simply due to this rapid regrowth of nerves, possibly finally reaching a barrier which they cannot pass through, leading thereby to a sensitive point such as one sees in the stump of an amputated limb. This seems to me to be a possibility well worth bearing in mind, particularly in giving a prognosis, and also an explanation of pain persisting where all the evidence points to the fact that the teeth were responsible. In other words, it does not seem to me that the occurrence of pain in such an area precludes the idea that the pain was originally due to the teeth. It merely serves to complicate the situation and may demand further surgical interference of a more radical sort. These cases are at best puzzling, and after such a superficial examination as the physician with his limited experience and knowledge is able to make, the patients should always be sent to the dentist. No doubt better results

could be attained if they were accompanied by their physician, so that, as before suggested, a certain amount of team work could be established.

The extraordinary thing, of course, in ordinary experience, is the marvelously bad condition of the teeth in the usual dispensary patient. People, thousands and thousands of them, are wholly free from trigeminal neuralgia who, nevertheless, have very bad carious teeth, not infrequently with exposed pulp cavities. This leads to the necessity of distinguishing sharply between toothache and neuralgia, which may somewhat easily be done. Toothache is a sharply localized pain, usually dull, but persistent; occasionally, however, of extreme violence. True neuralgia is always paroxysmal in character, more violent in its separate manifestations, with intervals of relative freedom. In examining the teeth of a person who complains of pain, we should endeavor to distinguish sharply between ordinary toothache and true neuralgia. From a practical standpoint, this is not a difficult matter. The cases become difficult when the teeth externally appear to be perfectly sound. Supposing the patient to have paroxysmal pain of the neuralgic type, percussion of the teeth is desirable by way of diagnosis. If, for instance, tapping of the teeth produces no feeling of discomfort until a wisdom tooth is reached, we have fairly good evidence that the condition of that tooth is responsible and that it demands expert treatment. If, on the other hand, we are totally unable to find any painful tooth even on percussion, and so far as our superficial examination goes, the mouth appears to be perfectly normal and perfectly cared for, the problem becomes an almost insoluble one. Repeatedly we see patients who have sacrificed a part or even all their teeth in the hope of obtaining relief from their pain, and even then not succeeding in doing so. On the other hand, there are certain cases which, as already suggested, in spite of apparently normal teeth, relief may come in a remarkable fashion from the proper treatment of a tooth which on close examination is found to be at fault. The following cases are of interest in this connection, for the histories of which I am indebted to Dr. Walton: A woman under middle age had had severe neuralgic pain in the occipital region, radiating to both sides, without dental pain or tenderness. She was given much morphia by general practitioners and finally sent to her den-

tist, with reference to a possible impacted wisdom tooth. He discovered a neglected cavity in the right lower wisdom tooth, with exposed pulp. The pain forthwith disappeared on treatment of the tooth. The interest of this case, apart from the error made by the physician in not sooner investigating the teeth and in giving morphine, lies in the fact of the location of the pain in the occipital region—a part not supplied by the fifth nerve.

Another case was a woman of middle age, wife of a physician, who for two weeks had complained of severe neuralgic pain in both the upper and lower jaw. Her dentist, after examination, reported nothing wrong with the teeth. The pain continuing, further examination of the teeth disclosed the fact that tapping the filling of the lower wisdom tooth on the left produced tenderness. The pain meantime became severe. Finally the tooth was opened by the dentist, with instant relief of pain, the opening being made directly into the pulp cavity. A few days later attacks of neuralgic pain occurred in the occipital region and on the right side of the neck. These attacks occurred with great frequency and became perfectly unbearable in their severity. There was, however, no pain or tenderness in the teeth. In spite of this fact, a later examination, although the dentist was skeptical of the responsibility of the tooth, showed that the nerve to that tooth was in great part destroyed. There was marked improvement in the neuralgia. The interest in this case lies in the fact of the extent and severity of the pain resulting from a defective tooth. It is also important that here again the pain was not only referred in part to the occipital region, but also even to the other side of the face. This matter of referred pain should constantly be borne in mind in the attempt to determine its cause.

Still, a third case was an elderly woman in poor physical condition, who suffered neuralgic pain in the right upper molar and infraorbital regions. The pain was sharp, paroxysmal, of irregular occurrence and extreme severity. A cavity was detected on the posterior surface near the root in the left lower second molar. Treatment of the nerve and sedative applications entirely relieved the pain.

These are all fortunate cases, so far as the discovery of the etiological factor is concerned. Many others result less favorably, and no doubt for many causes even when the teeth are respon-

sible. The question here presents itself of what is meant by the common expression, "killing the nerve." It should be remembered that, however radical your procedure may be within the tooth, you destroy an exceedingly small part of the nerve. There is undoubtedly immediate relief of conditions, but inasmuch as the nerve tends to grow again and it is impossible to reach beyond or even into the roots of the tooth, the recurrence of pain is by no means inexplicable.

Leaving the matter of the teeth, there are certain other questions which need brief discussion before I close. Supposing we have exhausted our resources, so far as the teeth are concerned, what next are we to do in the relief of the condition? The next resort must naturally be to surgical interference; but in this connection, attention should be called to a preliminary procedure in which much interest of late has been aroused. I refer to the so-called deep injections of the branches of the nerve by alcohol. This is particularly serviceable in elderly persons who for any reason are unable to bear an anesthetic. The most notable representative of this method of treatment in this country is Dr. Hugh Patrick, of Chicago, who has recently published results of some 150 cases. Although he begins this article by the statement that the technique of deep injection of the fifth nerve is simplicity itself, he later shows that very much under 50 per cent. are successful in the sense that the nerve has actually been reached by the hypodermic needle. It is undoubtedly difficult to find the nerve accurately by this method. If successful, however, the alcohol is injected into the nerve sheath with immediate paralysis of the nerve and consequent freedom from pain. If successful, this procedure is unquestionably a brilliant one and has a very definite place in the therapeutics of trigeminal neuralgia, particularly since it permits the treatment of elderly persons who for various reasons are unable to have a radical cutting operation. There have been no fatalities and relatively few mishaps, certainly in the hands of skilled persons.

If the alcohol injection fails, or for any reason is not practised, the next resource is to cutting operations, about which I will not go into further detail than to say that the peripheral operation, consisting of a mere resection of the nerve, is of small permanent avail. Deeper operations, as for example, on the second

and third branches at the foramen rotundum and foramen ovale, are very much more permanent in their effect, on account of the difficulty of regeneration of the nerve. The final operation on the Gasserian ganglion itself is undoubtedly the only one which insures permanent freedom from pain. This operation should certainly be trusted only to skilled hands. If this is done, the mortality from the operation itself is sufficiently small to justify its trial in the intractable cases. A modification of the Gasserian operation practised by Frazier and Spiller is the resection of the nerve between the ganglion and the pons.

I have said nothing about the drug treatment. It is unquestionably of value in certain cases, notably the use of castor oil and the pain-stilling drugs, except morphia, which should never be given as a routine.

In summarizing, therefore, the stages of diagnosis and treatment as it were, the following general statements may be made:

1.—Investigate the general condition of the patient; the arterial condition, the heart action, and general condition of nutrition.

2.—Determine whether there was any actual pressure on the nerve by tumor or other variety of new growth.

3.—Examine the nasal sinuses and the frontal sinuses.

4.—Investigate the condition and the treatment of the teeth.

5.—Before resorting to operation, make a preliminary trial with drugs.

6.—Use the alcohol injection method in suitable cases.

7.—Finally, operations of the more radical sort, beginning with the simpler ones near the periphery, leading up to operations on the ganglion itself.

I desire to close these cursory remarks as I began, by saying that this is a subject in which your branch of the medical profession and mine come into the very closest contact, and I feel very confident that we could learn a great deal from each other if there were only some more ready means by which we might be brought more closely together in actually dealing with concrete cases.

THE ORAL SECRETIONS¹

BY PERCY R. HOWE, D.D.S., OF BOSTON, MASS.

The oral secretions have been given but passing attention by bacteriologists in their studies upon the subject of tooth decay and other oral conditions of bacterial origin. The reason for this is because these secretions present, on the one hand, but comparatively small amounts of nutrient material and, on the other hand, contain no substance capable of destroying the bacteria themselves.

While bacteriology has given us a very generally accepted theory concerning tooth decay, it has pointed out no way of obliterating the process, nor has it explained why it is active with one individual and passive with another.

There are many on record as believing that the oral secretions contain substances that tend to promote or to immunize this condition, as the case may be, while the assurance that the relation of the oral fluids to oral fermentative processes is a close one, has tended to promote a more comprehensive study as to their exact nature, both under normal and under pathological conditions.

It has been shown that the saliva from the parotid glands is thin and watery, and contains serum, albumen, globulin, and the characteristic ferment, ptyalin; that the saliva from the submaxillary and the sublingual glands is thick and viscid, being practically mucin in a salt solution. So that in selecting mouth washes, it is well to recall that these organic substances are soluble in neutral and alkaline salt solutions, while they are coagulable in alcohols, acids, and more or less in the essential oils. The one acts to remove viscosity and the tendency to coagulate about active bacterial processes; the other acts to promote such coagula formation, together with its entanglement of food particles, epithelial débris, etc., suitable for bacterial nutriment.

On the whole, the data that we have with reference to the properties of the oral secretions, in cases where bacterial life is

¹ Read before the American Academy of Dental Science, Boston, Mass., March 6, 1912. See discussion, page 238.

active and again where it is dormant, are few. No orderly system of analyses has existed, nor have suitable instruments for the work been procurable. Many tests have been of doubtful value and many specimens have been examined, and reported upon, that have contained extraneous matter and fermentative products. The reports on acidity, or on alkalinity, are perhaps as frequent as any and often differ because of the method employed. It is to be remembered that a solution is acid or alkaline by reason of its H^+ or OH^- ions. The degree of acid strength depends on the number of H^+ ions dissociated, or OH^- ions in the case of alkalinity, and it is by chemic changes within themselves, productive of distinct color changes, that indicators point out the H^+ or OH^- ions. Some indicators react to a few, some require more ions to produce an effect. Phenolphthalein is a very sensitive indicator, is very generally used, and is an excellent one in this work. Five grms. to the liter is the strength to use, and with titrations against standardized acid or alkaline solutions (I use $N/100$ solutions) give a delicate and accurate estimation of the acidity or alkalinity of the oral fluids.

I have given this method in detail in an article entitled "Indicators in Salivary Analyses," and published in the Dental Cosmos for March, 1911. By this method of testing I have found the parotid saliva to be very frequently delicately acid (my own is .042 per cent. acid). The submaxillary and the sublingual is slightly acid, neutral or alkaline. In this connection we sometimes wish to know whether an acid found in the oral secretions is an organic or an inorganic acid, and I have never found an accurate method presented. Dr. Miller, in one case, determines that an acid is organic, because it fails to turn methyl violet first blue, then green; now this simply shows that the acid is a weak one. It might be a dilute inorganic acid, as well as an organic one. The following test distinguishes between the two, and I have adapted it to salivary work. Titrate one c.c. of the saliva and note acid strength.

Take one c.c. of the specimen, add 1.5 c.c.s. $N/100$ NaOH. If there is acetic acid present, for example, sodium acetate is formed. Evaporate in a platinum crucible and heat to redness. This makes carbonates out of the acetates. Cool and add 1.5 c.c. $N/100$ HCL, or exactly the same amount as of the $N/100$ alkaline solution. This

drives off the carbonates. Filter and titrate with phenolphthalein for an indicator. The difference between this reading and the first titration gives the amount of organic acid present.

In the case of the parotid saliva, this test shows the presence of an inorganic acid, and with other tests tends to substantiate the opinion that the acidity or the alkalinity of the saliva is due to monobasic or to dibasic sodium phosphate. I am of the opinion that such degrees of acidity and alkalinity as we meet with in the oral secretions, under normal conditions, do not materially influence the carbohydrate fermentation concerned with tooth decay. The lactic organisms, and they are many, flourish readily in such degrees of acidity. One kind, I am informed by specialists in this kind of fermentation in other research work, are active in as high as 2 per cent. acid solutions.

While other reports have been made of substances or conditions of the oral secretions in their relation to caries, as sulphocyanate of potassium, viscosity, etc., still on account of the length of this paper I must merely mention that the action of viscosity is physical and aids stasis, while sulphocyanate of potassium does not inhibit, but slightly augments bacterial activity of the kind under consideration, as I have demonstrated by experiment. But I will go directly on to speak of some experiments that show that the greatest factor in the activity of this fermentation of carbohydrates lies in the presence of phosphates in excess in the oral fluids. This, I believe, to be the most important consideration yet advanced in this connection. A slight increase in the phosphates artificially produces the greatest activity in a sugar or starch solution with exceedingly large and rapid formation of acid. One set of test tubes containing each one c.c. of saliva and one c.c. of r-glucose, incubated fifteen hours, require 2.5 c.c. $N/_{100}$ NaOH to neutralize the acid formed. Another set containing the same, with a slight amount of sodium phosphate (dibasic) added, after the same period of incubation, required 27 c.c. of the $N/_{100}$ NaOH for neutralization; or, in the first, .22 per cent. lactic acid; in the second, 2.43 per cent., an increase of more than 1,000 per cent. Indeed, it is to be believed that *some* phosphates are *essential* to this carbohydrate fermentation. Upon looking into the literature on the subject, I find that it is so considered in alcoholic fermentation, and I believe it to be so here. In alcoholic fermentation,

yeast is the fermenting agent; the media, sugar, and the alcohol and carbon dioxide the result of the action. Here the phosphates prolong the life and excite the activity of the yeast that is productive of a very much larger amount of alcohol and of carbon dioxide. Lactic fermentation is a comparable process, and the same stimulating effect of the phosphates is as fully to be seen here in the formation of large amounts of lactic acid. In milk the effect is to be seen by its souring earlier, and with a larger acid per cent. upon increasing the phosphates, as I have shown by experiments.

These salivary experiments include several hundred tests, tests with different phosphates, with different sugars and starches, in chemically pure samples and as found in the different food-stuffs, and with different cultures of lactic bacteria.

Hence, I feel that inasmuch as phosphates are always present in the saliva in a greater or less degree, either as monobasic or dibasic sodium phosphates, that it is not so much a question of alkalinity or of acidity as it is increase in the amount of phosphates that augments the lactic acid formation admitted to be the incipient step in carious action. To those who are interested I will say that these experiments are in press and will appear in the *Dental Cosmos*.

The restraining influence of chlorides I have also demonstrated as cutting down the fermentation, particularly with low phosphates. I have test tubes containing saliva, starch, and added chlorides, in which no fermentation has taken place at the end of several weeks.

I have been particularly interested in this work, and have devised instruments for obtaining saliva direct from the glands and others for exact measurements in determining certain physical and chemical properties, for viscosity and specific gravity estimation. In addition, I have worked out volumetric tests for determining, with accuracy, the acidity, the alkalinity, sulphates, chlorides, phosphates, tests for oxidations and reductions, and some others that I feel are reliable for the indication of certain bodies. Some of these, too, have appeared in the *Dental Cosmos* from time to time, and are convenient for reference for any that are doing this kind of work.

That the oral secretions are protean is well established. To

what extent changes in their composition take place is not definitely determined, nor is it known with any certainty what brings about the presence or causes the absence of the different substances that are sometimes found—calcium, for instance—the thyroid gland is now held by some to determine the output of this substance. We know that no substance is taken physiologically into the system, goes the round of nutritional changes and appears unaltered in the fluids of any gland unless it be a foreign substance, foreign to that system, and which is being eliminated as best it may.

I have in the *Dental Cosmos* an account of some experiments, in which I endeavored to bring about changes in the oral secretions by dieting a number of individuals, first on a heavy carbohydrate diet and later on a heavy proteid diet. As I look back on these experiments I am far from satisfied with the work, yet it became very evident that many alterations in salivary composition could be effected by this means.

Dental caries, almost universal in its attacks, is primarily a disease of childhood. Its action is local. The microbic life concerned has been differentiated to such an extent that we know that no especial organism dominates the field, but that a class of fermentative organisms are the active destructive agents. Yet research has shown that in kindred and analogous processes, certain substances have an effect to augment or to check the action. These substances are present in the salivary fluids, and by bringing about an increase or a diminution in the amounts, we may reasonably expect to obtain similar effects in the mouth. I believe that intelligent systemic treatment at the period of life when active caries commences, governed by analytical study of the salivary fluids, can do much towards checking the process. The whole question as to what alterations may be caused in the oral secretions and how, and as to what composition augments, and what restrains, bacterial activity within the oral cavity, opens a tremendous field for study, and there are many who are ready to assert their belief that through this means lies a direct and efficacious step toward inhibiting dental caries. The work is progressive and in keeping with that of the kindred sciences, and although hardly begun, is along lines that must be gone over in any search for a scientific means of obliterating the process.

A NEW AND ORIGINAL METHOD OF USING PORCELAIN¹

BY STANLEY TOWLE, D.D.S., FALL RIVER, MASS.

It gives me pleasure to come before you, and to have the opportunity of meeting you men who are among the leading exponents of our profession. It is not my purpose to criticise the popular methods of using porcelain, but I shall attempt to show you a method which is a great improvement over the older processes. This system has many advantages, chief of which are accuracy of procedure, a better-fitting filling, economy of time, better color effects, a conservator of energy on the part of the operator, and that porcelain may be extended judiciously to the posterior teeth.

The principles which I follow in this work are the same for all classes of fillings, with the exception of cases where a bite is needed. Therefore I have chosen a cavity which I have prepared by grinding a right superior central incisor for an illustration. This cavity extends across the labial surface, running down the mesial to the palatal wall (Fig. 1). It is only in rare or crowded conditions that it is necessary to make any previous separation. In all cavity preparation there are certain rules which must be followed, but inasmuch as it is not the purport of this paper to discuss cavity preparation, suffice it to say make any retention desired, grooves, pits or holes for pins, avoiding all undercuts. If any undercuts remain they may be temporarily filled with wax.

Having the cavity prepared, a celluloid strip should be passed between the teeth, which usually can easily be done. The next step is to take an impression of the cavity in cement. If the tooth is allowed to remain wet, there is no necessity of using an emollient to prevent sticking. The cement should be quick setting, well spatulated, mixed thick and kneaded with the fingers until stickiness disappears. If the filling is to be finished at once, the cement best adapted is Britton's Vitrified, otherwise Caulk's Petroid Improved.

¹ Read before the Section on Crown and Bridge Work, Porcelain and Gold Inlays of the First District Dental Society of New York, March 20, 1912.

FIG. 1.

FIG. 2.

FIG. 3

FIG. 4-

FIG. 5



FIG. 6.

When the cement has assumed a non-sticky condition, it should be shaped to a point which is introduced into the bottom of the cavity and pressed well home. In two or three minutes the strip can be removed. This has served the purpose of making a little room for the removal of the impression, as well as for confining the cement.

When the impression is removed we have an exact counterpart of this portion of the tooth with the cavity in it. Before proceeding with this impression, it is necessary to treat the impression surfaces with a varnish. The object of the varnish is three-fold: first, to insure a perfectly smooth or glossy surface; second, to aid in separating the model from the impression, and, lastly, to allow for the shrinkage of the cement.

After the varnish has become hard, which takes only a few minutes, the impression is ready for the wax. Any good casting wax may be used for the model, and it may be run into the impression by heating the cement, allowing it to run in, or by waxing it in with hot spatulas. Two precautions are necessary: one, if you heat the impression, to be sure the cement is thoroughly set; the other, to be sure the wax runs down into the angle formed by the tooth and the cavity.

The next step is a purely chemical one, viz.: the impression with the model of wax in it is suspended in hydrochloric acid C. P., which dissolves the cement away in a few minutes, leaving the model of wax. If this model is washed with alcohol we should have a perfectly smooth reproduction of the cavity and adjacent parts. The wax model is now cast in pure gold. This casting must come from the casting ring in a smooth, polished, and perfect condition, free from bubbles, and with accurate and sharp angles.

Before proceeding with this process, let us consider one or two of the many important points of color and baking of porcelain, and cementation, and discuss them in unison, as they are inseparable.

We cannot scientifically understand color without going a little outside the realms of dentistry and probing into the laws of light and ascertaining how these laws behave in regard to porcelain.

Science teaches that light is vibrations of ether, and that

these vibrations are of different lengths, each length when it meets the retina of the eye producing a certain sensation, which we call color. The same length of vibration always producing the same sensation or color. We have also learned by the laws of refraction that different lengths of vibration are bent in different degrees as they enter denser mediums. Therefore, we are able to analyze light and color, and if we allow a beam of light to pass through such a medium, say a prism of glass, we find that white light is composed of three colors, viz.: red, green, and blue, distinct colors in themselves; but when mixed in different proportions make all colors, from red to blue, or, I might say, from black to white. The reason why different objects have different colors is due to the law, "When light passes through any substance that substance absorbs all colors but its own." The reason for this is readily seen when we study vibration. A tuning fork will communicate its own vibrations to another of the same note, but it loses its own motion much more quickly by so doing. If waves which produce red sensations require vibrations to the number of 450 millions of millions in a second, and such rays pass with others through matter whose atoms vibrate at that rate; if set in motion, these atom vibrations must themselves take up or absorb a part or all such from the ether, leaving only the other colors to pass through.

Therefore, we see that the difference between translucency, transparency, and opaqueness is one of degree only, for anything, even cement, is translucent and even transparent if thin enough; all things are opaque if thick enough. Hence, it is absolutely necessary to have the cement the thinnest possible to get the best color effects.

(Several slides were shown in colors, demonstrating these points, which it is impossible to reproduce.)

Now, it is plain to see the only light we have to deal with in porcelain is reflected light. Our first problem in porcelain is, "How shall we make the light which we see by reflection in porcelain backed up with cement to be the same as it is in tooth structure which has no backing?" We have to meet this with other laws known as refraction and reflection. The first reflection comes from the surface and varies according to the character of the surface and not to the special mixture of which the porce-

lain is composed. Could any material be so highly polished that absolute total reflection took place on the surface, the thing itself would become totally invisible. If this be a porcelain, we get a reproduction of the light which reaches it; if a bright light, a bright appearance; if a dull light, a dull or dark appearance.

If the surface is not perfectly smooth or regular it is very different. The variety of reflections are countless, the body behaves like a candle and becomes luminous and if the surface is irregular enough it will appear white (Fig. 2).

The second reflection comes from the body of the porcelain, and this is of great importance. We meet here the same condition that we meet in the prism, only there are myriads of little prisms which mix the three colors more or less. Let us examine, for example the crystals of the snowflake. In their many and polished surfaces they reflect the light in every direction, and as we have seen when these three primary colors are thoroughly mixed, we get white. Therefore, the extreme whiteness of the snow. But should any process, such as melting, destroy these surfaces, at once they lose their mingling of colors, absorption begins to take place, the ice becomes transparent or translucent, and the color materially changes. Again, all crystalline substances, such as porcelain, have the power of polarization. (Samples were shown in colors of different crystals polarized.) Considering these facts, it is necessary to keep the porcelain as much of a crystalline substance as possible, so that the light will be reflected back before it reaches the cement.

What light is left passes through to the cement, which is the third and last reflector. The light is here totally consumed or dissipated, the cement absorbing all colors except its own, which is reflected back.

Now as regards refraction. The light which strikes perpendicularly on the surface is not refracted, but the instant it assumes an angle, refraction takes place. As the porcelain passes down between the teeth, refraction increases. We finally reach an angle where the blue rays, being bent more than the red and green, are totally refracted and the porcelain assumes a shadowy condition.

So we see three colors are all that are necessary to produce harmony in teeth of normal color. We will first consider the third reflector, the cement. By a spectroscopic examination we

find the white cements to reflect more of the blue rays than the normal dentine, and that the darker cements as the gray, etc., reflect more of the red. The nearest to similar reflection I find in Klewe's No. 1.

Hence, I use this cement for all fillings, and call this one of three colors necessary in porcelain work. The two powders best adapted for my use, I find in the No. 3 and No. 4 Jenkins Enamel. Any tooth which I cannot produce harmony in, with this combination and my method of baking, I consider impracticable for the use of porcelain for color effects. The method I have adopted for selecting color is to take note of what certain proportions of the powder when cemented in certain localities result in. Thus No. 3 and No. 4 equal parts in labial cavities give me No. 45 S.S.W.

In regard to baking, I consider it advisable to use the open furnace. The porcelain should be removed from the heat at once, as soon as contraction has taken place, in all bakings except the final, and as this varies according to the size of the filling, it can only be determined by watching it. Again, the thinner parts of the filling will contract sooner than the thicker parts, if left in the same temperature; hence these parts must be placed in the cooler portions of the furnace and watched. For the sake of strength and color, it is absolutely necessary that the last baking be not carried far enough to lose the granular structure. This can only be determined by the eye.

We will now turn our attention to the cementing, and for the purpose of illustrating, we will suppose we have a tooth in which we are to place an inlay, and we will suppose we have a perfect inlay (Fig. 3), one which is an exact counterpart of the cavity. To cement that inlay into its proper place is so near an impossibility that it is safe to say it cannot be done, for with the greatest of pressure, some cement will remain at the bottom of the cavity and prevent the inlay from coming into actual relation with the tooth. Cement is not a glue. Glue depends on the close fitting joint for its strength; cement needs some bulk.

If we would have a perfect inlay and attempt to cement it, we would meet with the results shown in Fig. 4, the dark line representing the cement. From $\frac{1}{500}$ to $\frac{1}{1000}$ of an inch seems to be as thin as it is possible to press cement from under the filling. Therefore, in cavities of any size with a flat base or seat it is ad-

visible to obtain the condition shown in Fig. 5. This will allow for this amount of cement everywhere except around the margins to a depth of about natural enamel. An inlay made in this shape can be easily cemented into place, and when in position the seam of the cement is the thinnest possible around the margins. This also aids in color, for the cement is so thin that it is almost transparent, the inlay seeming to take on the color of the tooth. You may notice the margin of the porcelain is a little below the tooth. This is not necessary, but I think it advisable in the majority of fillings in posterior teeth on the occlusal surfaces.

In small cavities or cavities without large floors, if we put the gold castings into aqua regia, together with a piece of gold foil such as is used in the Jenkins system for matrices and leave them there until the foil disappears, the gold will be clean, polished, and a sufficient amount eaten away to allow for all shrinkages. Where the filling is large or the base flat, if we take the casting of gold and over the floor running up a portion of the side walls, we flow a thin layer of wax and then put it into the aqua regia, the wax will prevent any action on the gold beneath it, and we get a condition like this which is a cross-cut section of the model in question (Fig. 6). This will give us the result of which we have previously spoken, which is necessary in order to accurately cement the filling in place. We are now ready to proceed with the baking.

The powder should be pressed in hard with brushes, which can be done, as the model of cast gold is very strong and will not be distorted, and should be brought to perfect contour the first time. I place importance on the fact that the surface should be left granular and not smooth. In preparing for the second baking, we should treat it the same. The shrinkage after this baking should be very small. For the third and last baking, the labial surface should be perfectly smooth, while down between the teeth it should be left granular again for color effects, to which we have previously alluded. After this is cold a disc may be run over the edges, revolving toward the porcelain, removing any overhanging feather edges.

The removal of the gold from the porcelain is an easy operation, and can be done with nitro-hydrochloric acid, the time required being about half an hour for the largest fillings, provided

the solution is hot. It is not necessary to entirely dissolve the gold, for, after the matrix has become thin, it can be readily peeled off. The porcelain should be boiled in bicarbonate of soda to destroy traces of the acid, after which, if it is washed thoroughly in alcohol, it is ready for cementation.

The only difficulty in using this system will be found to be the checking of the porcelain at the last baking. This can readily be overcome in three distinct ways: First, by casting a thin matrix; second, by taking the porcelain and gold between the fingers and bringing pressure so as to help the porcelain expand the gold. This can be easily done, for the checking does not take place until after the porcelain can be held in the hand. The third and surest way is to have the aqua regia at a boiling temperature, and when the porcelain has cooled to the same temperature, put it in the solution and dissolve the gold off before it is thoroughly cooled. In case of corner restorations and other approximal fillings it is not necessary to try them in, for with a delicate pair of calipers measurements can be taken which will be an accurate guide. In cases where a bite is necessary, if we take one in modeling composition or wax, the gold casting can be placed in its proper position on this and an articulation made in the usual way. Wherever it is desirable to use pins they should be placed in their proper position in the cavity, and when the impression is taken they will come out in the cement; when the cement is dissolved away, they will be left in the wax, to be cast in the gold. The aqua regia will not affect the pins and they will be retained in the porcelain.

This same system can be judiciously used in the making of porcelain crowns, the only difference being that we take an impression of the end of the root with the pins in place instead of a cavity.

It also may be used in the repair of bridge work where a facing has been lost, resulting in a new facing, which accurately fits the place from which the old facing has been broken.

The gold may be reclaimed from the chloride solution by precipitating with a solution of ferrous sulphate, the gold being thrown down as pure gold in the form of an orange brown powder.

PRESIDENT'S ADDRESS¹

By E. H. SMITH, D.M.D., BOSTON, MASS.

Members of the Massachusetts Dental Society, Ladies and Gentlemen:

The honorable position in which I find myself to-day is in no sense due to any special or general work that I have done in the State Society.

It is true I have attended some of your meetings and have acted as consultant in many of your activities, but I certainly am not entitled by virtue of hard organization work to the reward of the highest gift within your power to bestow.

What, then, was the reason that you saw fit to make me your president?

I like to believe that the reason may be found in that you found in me a symbol of what our Society stands for and has courageously worked for—namely, educational progress and the uplift of the profession.

I am led to think this, for the reason that I have always had the support of so many members of our Society in my efforts to purge our dental schools of commercialism and to bring about a higher plane of education and efficiency.

For many years I have worked along these lines, for the virility of our organized Dental Societies depends upon the product of our dental schools.

If the product is bad our societies will be bad.

If the product be good, the influence of our societies will be such as to readily overcome the obstacles that now hinder professional growth, and our societies will become powerful agencies in the betterment of the world.

If students are trained in commercial schools in a commercial environment they will go out into the world as commercial men, not as professional men, with the result that you will continue to see enacted in our dental societies legislation that has a commercial rather than a professional motive behind it.

¹ Read before the Mass. Dental Soc., May 2, 1912. See discussion, page 277.

We speak of commercialism and professionalism—what do we mean by these terms? Let me try to define them:

By commercialism we mean the spirit or principles of trade.

By professionalism we mean the methods, manners, or spirit of a profession.

Most of us, I think, know that the ethics that govern trade are quite apart from the ethics that govern a profession.

For instance, in trade it is right to foster secrets; in a profession it is decidedly wrong.

We have much more to do than simply say we are professional men—we must act and behave like professional men.

Cooper said: "Professions pass for nothing with the experienced when connected with a practise that flatly contradicts them."

Let us take a concrete example, as it affects our profession. For a long time we have been trying to outgrow our dependence upon the trade journal, and to shake ourselves free of its influence—an influence more pernicious, perhaps, in principle than in fact, for the trade journal has been helpful to the profession in the past, is helpful now, and will no doubt continue to be helpful in the future.

But we cannot get away from the fact that at the bottom it is dominated by trade, while with a professional journal published by the profession and for the profession, there can be no such charge.

The motto of professional journalism may well be, "Hew to the line, let the chips fall where they may."

In supporting a professional journal and publishing our proceedings in such a journal, we are but following in the wise footsteps of our sister profession—namely, that of medicine—and at the same time living up to the true spirit of professionalism.

THE JOURNAL OF THE ALLIED SOCIETIES is now on a firmer foundation than ever before.

It stands for true professionalism, and is entitled to our loyal support and the support of every progressive dentist.

With such support the present is secure and the future bright.

During the past few years many of our profession have been active in the crusade of mouth cleanliness. This crusade has been world-wide.

It has awakened the physician from his lethargy and caused him to realize the grave danger to the community through the communication of disease by unclean mouths.

The public have become interested and through school committees and dispensaries have sounded the alarm for the better care of the teeth.

For the widespread enlightenment on this important question we are largely indebted to the hard, intelligent work of our Massachusetts Oral Hygiene Council.

During the past year I have looked into this matter with some degree of thoroughness, and I unhesitatingly recommend that our Society continue its support to their organization by the judicious appointment of members to the Council and by a liberal appropriation of money for its needs.

Recent medical inspection of our school children has resulted in bringing our attention to the very large per cent of defective children, whose defectiveness is wholly within the oral cavity, and we are rightly asked to furnish the facilities to remedy this deplorable condition and to care for the teeth of the children, and we awake to this demand only to find that our professional organization is so incomplete that we are unable to do our full duty to the people.

The recent agitation over the Dental Nurse Bill, coupled with the defeat of the measure, have shown to the world that there are, at least in Massachusetts, a large number of dentists who, by their action, have said to the world that as a body we are not to be trusted as the physician is trusted with the trained nurse, that we are not high-minded enough to prevent the nurse from overstepping her prescribed field of work, that there are many fakirs in the profession, and the influence of these fakirs for bad is greater than the influence of the non-fakirs for good.

Moreover, they dealt the profession a wicked blow when they made the commercial cry that the presence of the trained dental nurse would be an undesirable competitor of the young practitioner.

However, in spite of this opposition, I declare that the dental nurse should be part of our equipment, and to that end I recommend that suitable steps be taken to educate the dentists and the people so that they may understand the true value of the dental

nurse and to continue the demand for the passage of a suitable Dental Nurse Bill until the measure is accomplished and the stigma now resting on our profession is removed.

There is a sentiment, how widespread I cannot say, in favor of a Postgraduate School in Dentistry, under the auspices of our State Society. In regard to such organization I would say that the Massachusetts Dental Society is a corporation, with all the rights, privileges and responsibilities that pertain to a corporation, and can hold property to an amount not exceeding ten thousand dollars.

This sum of money is totally inadequate for the proper financing of a Postgraduate School in Dentistry.

Furthermore, I think it unwise for any State Society to found or manage a school in dentistry.

However, as the act of incorporation was for the purpose of advancing the science and art of dentistry I recommend that a suitable committee of three be appointed—one for three years, one for two years, and one for one year—whose duty it shall be to increase the membership of the State Society.

Upon the increase of members we would have an increase of revenue, and with more money at our command we could establish a Society Scholarship to be applied to members who may show ability in any line of research work pertaining to dentistry, the member receiving the scholarship to be allowed to pursue his investigation in any way that he may see fit.

In investigating the constitution and by-laws of our Society I find a lack of uniformity which may at any time lead to serious dispute in regard to the meaning of certain by-laws.

I would call your attention to the statement in the Constitution, Article II., Section 1, which says that the government of the Society shall be by a Board of Councillors, and then goes on to limit their duties in government by stating that they shall annually choose by ballot the various officers of the Society.

In the By-laws, Article II., Section 1, the duties of the Councillors are again limited to the choosing of the various officers.

The custom in the past, of discussing and taking final action, so far as debate may go, upon various Committee reports before the Board of Councillors, is at variance with the Constitution and By-laws.

I recommend, therefore, that a Committee be appointed to investigate these discrepancies and report needed changes at the next annual meeting.

The last report of your Treasurer shows the Society to be in a healthy financial condition.

The report from the various District Societies shows energetic and progressive work.

I would suggest, however, that the Secretaries of the various District Societies be requested to send notice of their various meetings to the President, the Executive Committee and the Secretary of the State Society.

It may frequently happen that important professional matters may come before a District Society which concern the entire membership of the State Society, and which the officers of the State Society have a right to know.

Our Society was incorporated March 30, 1865, and has had its ups and downs during the forty-seven years of its existence.

On the whole, its influence has been for the best, and with proper management it can be made a great professional force.

It was founded by such men as N. C. Keep, I. J. Wetherbee, Thomas Chandler, Luther D. Shepard, George T. Moffatt, and their associates, all of them men of great professional strength.

It rests with us to so conduct our Society as to attract to membership and management men of equal ability.

THE TECHNIQUE OF IMPRESSION TAKING AND MODEL MAKING¹

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CITY

It may seem to some that I have chosen a strange topic upon which to write a serious paper, yet if one may be permitted to judge by models brought in as a basis for consultation, this surely is a branch of our work in which the vast majority of our profession might profit by instruction. Indeed, it is the one corner of dentistry in which the most slovenliness is exhibited. Slovenliness, demonstrated not alone in the illy made models, but what is far more important, slovenliness in the management of the plaster when taking the impression.

Why is it that so many operators use modeling-compound? Not one per cent. of those who do will argue that modeling-compound is better than plaster of Paris for taking impressions where teeth are present in the human mouth. Why, then, do they use it in preference to plaster of Paris? Many will tell you, "It is so much pleasanter, so much cleaner, than plaster of Paris." But they make a mental reservation of the fact that they find it easier to use modeling-compound; that, indeed, they do not know how to take impressions with plaster of Paris. Moreover, it is not true that modeling-compound is either pleasanter, or cleaner, than plaster of Paris. It is a common experience of orthodontists to have some dental practitioner, or some pseudo-specialist in orthodontia, come in for advice in "a regulating case" and present models which really are a disgrace, and calmly remark: "Excuse these models, Doctor, I made them in a hurry." Oh, if these gentlemen but knew how sickeningly unoriginal that excuse is and Oh, if they could but be made to comprehend how absolutely inexcusable are these "models made in a hurry!" Why should impressions ever be taken without time in which to do the work properly, and if done properly no "hurry" can excuse the operator from ruining them by producing models that are an abomination to the sight? For this is the fundamental point. No man,

¹ Read before the First District Society, S. N. Y., March 4th, 1912. See discussion, page 263.

FIG. 1

FIG. 2



FIG. 3.



FIG. 4.

woman, or child should be made to submit to the taking of even one set of impressions, unnecessarily. Hence, when the operator is in "a hurry" then he should understand that "he has not the time" to take the impressions or make the models.

In Fig. 1 we see nine sets of models, all made by the same man. They are above the average, and the fact that they are above the average is a disgrace to our profession, because they are far below the standard of what they should be. Let me pause a moment to explain why I consider the bad model making of dentists a disgrace. It is because the work of rearranging the human teeth with its correlated remodeling of the human face is one of the highest arts. The same is true of prosthetic work. Therefore, both the orthodontist and the prosthodontist should be artists, and all their work should be artistic in character. Surely, the models used in studying and planning an artist's work should show some evidence of the artistic temperament.

Let me relate an incident to accentuate this. About a year ago a dentist called on me for "advice in a regulating case," as he phrased it over the telephone. At the appointed hour he called, handed me a set of models and asked: "What would you advise me to do for this patient?" I studied the models for a few moments while he placidly gazed at them with me, and then I said: "If you really have this patient's interest at heart I would advise you to place her in the hands of an orthodontist." "Why," said the dentist, "do you think that case so difficult?" "No," I replied, "it is rather simple." "Then why do you tell me to send the patient to another man?" And I answered very frankly, "Because you have not even apologized for these awful models. I waited several minutes for you to tell me that you 'made them in a hurry.' But you have offered no excuse whatever. Therefore, I accept them as an index of your artistic standards, and I would be sorry to place any child in your hands for such work."

He went away angry, whereas he should have been grateful to me because I told him the truth, and probably opened his eyes to a deficiency.

Glancing again at the models shown in Fig. 1, I say that they are above the average. They are above the average, because it is evident that the gentleman who made them has come within the influence of the art of model making, inaugurated by Dr. Angle,

and that he has aimed at the correct standard. The fact that he has not reached it merely indicates that his handicraft is not yet equal to his appreciation of what should be. But we observe that the models are all from plaster impressions; second, that something more than the teeth is shown; third, that some attempt, however crude, has been made at trimming up the artistic parts of the models. I use the term "artistic" here to differentiate between the anatomical and the other parts of the models. There is one glaring fault to be noted. In several instances broken teeth have been replaced and stuck fast with wax. Nevertheless, if the man who made these models is present to-night I have no doubt that he will produce better results in future.

In Fig. 2 I show you a set of models which, though far from ideal, yet I think compare favorably with those in Fig. 1. Models made in this style will look neat and artistic when placed in a cabinet, and this is an important matter, because the impression made upon a prospective patient's parents, when looking at your collection of models, may have an influence upon getting or losing the case.

Technique for Upper Impressions.

Let us now consider the details of taking impressions with plaster of Paris. The first essential, of course, is the plaster, and this is often a serious problem. Plaster makers have told me that the working qualities of a barrel of plaster may be materially altered by moving it from the warehouse to the dentist's office on a rainy or even on a damp day. Also that they have never been able absolutely to reproduce a given batch of plaster. With material as sensitive and as variable as this, we have but one recourse, and that is to purchase it in as large a quantity as may be convenient. The advantage of buying a barrel of plaster is that when you do happen to obtain a good working batch you have a plentiful supply. When my office was in a house I always obtained two barrels at a time, keeping them in the cellar. Now that I am in an office building and have not space for even one barrel I have obtained my best results by purchasing three cans of plaster at the outset. Then as a can is emptied another is bought. By this means my plaster is kept in my rooms for two or three months

before it is used, and this seems to be an advantage, although even now I sometimes am forced to discard a can.

I may say that I use what is known in the trade as "French's Impression Plaster," which is fairly quick setting, and I use it for both impression and model. I do not add any hastening medium.

In taking an upper impression the first essential is that everything should be in readiness and the patient fully prepared for the work in hand. On the stand I require a glass of water, a finger bowl, also partly filled with water; two or three orangewood sticks with cotton wrapped about the ends to serve as swabs; and I may say that the cotton swab should not be a great mass of cotton, but should be a small, tightly-wrapped swab. I also have a number of swabs made of Japanese bibulous paper lying loose upon the table. Also a piece of cardboard to receive the pieces of the impression when removed from the mouth; a pair of foil carriers; a pocket knife, with large blade open; a sharp pointed instrument for scarring the plaster, and, lastly, a piece of soft sponge.

By way of preparing the patient I explain in detail what I am about to do and what will be expected of him or her. For example, at one stage of the operation I require both of my hands, and consequently the patient must hold the impression tray in place by partly closing the mouth, as we shall see. This is not only explained to the patient, it is rehearsed. The patient is also assured, should she show any anxiety on that point, that no plaster will trickle down her throat; that the chin is to be kept up and the head thrown back; and, with the head in this position, she is asked to try to swallow, whereupon she will discover that she cannot. A properly-fitting tray is selected for the case and everything is in readiness for the impression.

The plaster for the impression should be sifted into the water and allowed to sink below the surface until the proportion of plaster and water produces the consistency of "double cream." The mouth should be examined to note whether the vault be high or low. If very high, a little plaster should be carried to place in the vault before introducing the tray. The plaster should be placed in the tray cautiously, lest there be an excessive quantity. There should be just enough to fill the deeper parts of the tray, up to, but not higher than, the edge of the rim. Only a very little, if any, should be placed over the high part of the tray—that is to

say, that part which conforms to the vault. A tray thus filled is carefully introduced and gently pressed up, until the teeth are fully submerged in the plaster, but no more. The patient is then asked to close gently, in accordance with the instructions given at the "rehearsal," and to remain at rest as soon as the lower jaw is supporting the tray. This releases the operator's hands. There should be so little plaster in the tray that none is in view; certainly none should escape to soil the face and generally mess things up, as would be the case if an excess were used. The left corner of the mouth is now lifted up, as seen in the illustration (Fig. 3), and plaster is introduced with a small bone spatula. For this purpose I use a common bone envelope opener. With this, plaster in small quantities is placed over the gum in the molar region and then forward over the bicuspids, cuspids, and incisors, carefully manipulating the plaster to avoid imprisoning air and thus forming air spaces. Reaching the median line, the opposite corner of the mouth is lifted and plaster introduced on that side in a similar manner, always working from the molar region forward, wasting no time, but never operating in a hurry.

The plaster thus having been placed over the soft tissues in the buccal and labial regions, the head is tipped far back, with chin up. The operator, by stooping slightly, is now enabled to obtain a full view of the region of the soft palate. Placing a finger of each hand so as to support the tray at each corner of the mouth, the tray and plaster are forced upward gently. By this time the plaster, if not mixed too stiff at the outset, will have just begun to set, and as the tray is pressed upward the operator may watch it ooze out beyond the back edge of the tray, and may stop before sufficient escapes to cause any annoyance to the patient. Should the least bit more escape, as may sometimes occur, the operator promptly and delicately removes it with the cotton swab.

We hear a great deal about "nausea" and "gagging" during the taking of impressions, whether with plaster or with modeling-compound, and I am positive that this can be more easily prevented when using plaster than when using compound. The reason is that the "gagging" is usually caused by some impingement upon the soft palate. By the technique here described a skillful operator can keep the soft palate clean and free from irritation at

all times, whereas when using modeling-compound it is practically impossible to prevent the material from extending back and pressing upon the soft palate.

Even when the soft palate is not easily irritated, it should be watched and kept free from plaster, as here described, for another reason. The palate may not resent the presence of the excess of plaster of Paris while it is plastic, but it must be remembered that the soft palate is the movable roof of the mouth, and that in the act of swallowing it contracts downward. As soon as the plaster begins to set any saliva trickling into the back of the throat causes the patient to attempt to swallow; the soft palate contracts downward and fractures off the plaster that may lie against it, or beyond the posterior border of the hard palate.

It has already been explained that with the technique described this would be impossible, because no plaster would be lying against the soft palate. Nevertheless, in case this detail of the method should be overlooked and such an emergency should arise the operator should be prepared to meet it with quick action; action fully thought out in advance. As soon as the particle of plaster is dislodged, the patient, becoming anxious not to swallow it, would throw the head forward. This not only prevents the operator from reaching the back of the throat, but actually invites the very disaster that the patient seeks to avoid. If those present will throw the chin well forward upon the chest they will at once discover that it is quite easy to swallow with the head in that position. But if they will throw the head well back, it will be found that the act of swallowing is made most difficult. This should be fully explained during the advance "rehearsal," so that the patient, should any accident occur, will not resist the operator, who must grasp the forehead firmly so as to hold the head back, and with the other hand quickly and deftly remove the dislodged piece of plaster with a swab. The best course, however, is to avoid the accident by keeping the back of the throat perfectly clean throughout the entire operation.

Once the impression has been pressed up to place it should be held firmly and immovable. A few minutes must elapse before the plaster will have set hard enough for a removal, and here I may state that the longer the impression can be kept in the mouth and the harder the plaster is allowed to set, the more perfect will

be the impression and the resulting model. Indeed, this is the real secret of those well defined, beautifully outlined teeth and gum margins that you have so often admired in the cabinets of orthodontists. Their models are better than yours, largely because they allow the impression to remain in the mouth two or three minutes longer than you do.

It is important, therefore, that you keep your patient from becoming restless. To avoid this, keep the patient's mind impressed with the notion that the work is progressing. Keep busy; be doing something all the time. Use a swab and remove any particles of plaster that may break off. Take up the sponge and sponge away bits of plaster that may be about the mouth or face. If there is a free flow of saliva, insert the saliva ejector, and, in addition mop up the saliva with the paper swabs. But, above all, do something; do anything rather than just hold the tray in place and stand behind the chair, like a wax image, waiting. Remember that waiting is a tiresome occupation.

When the plaster has fully set, as may be tested by that remaining in the cup, the time will have arrived for the removal of the impression. Let me pause here to call your attention to the fact that I said "cup." Never bring one of those abominations, a rubber plaster bowl, into the presence of a patient. A white china cup is much better, much cleaner, and, besides, has a handle.

In removing the impression the first step is to remove the tray. The tray should be grasped firmly, the middle finger resting tightly against the roof part, and then with a downward and slightly backward pressure, the tray is dislodged, coming away clean and leaving the impression in the mouth, as shown in Fig. 4. Once more an examination should be made to be assured that no loose pieces of plaster may not have broken away, with the possibility of irritating the patient and causing coughing or gagging, just when you desire that she should be most quiet. With the Angle trays, which are the best as yet obtainable, it sometimes occurs that a fracture may occur in the molar region. Occasionally the piece may come away in the tray; but sometimes, though broken away from the main mass, the piece or pieces may remain in place. The molar regions, therefore, should be observed, and such pieces removed first. Next an incision should be made in the plaster in the region of the canine fossa on the left side. I use a

right-angled scaling instrument for this purpose, but a sharp hatchet excavator will serve as well. This cut should pass almost entirely through the plaster, care being observed not to pass completely through and wound the soft tissues. Next the wide, thin blade of a pocket knife is forced into this incision, as shown in Fig. 4. The knife is then twisted distally and outwardly, dislodging the buccal fragment. The same method is followed on the right side, the right buccal fragment being removed. The central, or incisal, fragment may then be removed, after which the part in the roof of the mouth may be carefully teased down and out.

As the fragments are removed from the mouth they are placed upon the card on the table. This card is a part of the office system. Upon it the name of the patient is written, and upon it are to be placed first the impression tray and the fragments; next the assembled impression; then the retouched impression; then the varnished impression; then the impression after it is poured, and finally the model itself after separation, and until it is finally finished and placed in the cabinet. Thus at all times this card is a record by which may be known the name of the patient for whom the work is in progress. When there may be a number of patients for whom work is in hand, these cards will prove to be a great convenience, as a certain and ready means of identifying work in all its stages. These cards are cut for me about 6 x 8 inches in size.

It is my custom to assemble the impression immediately. Plaster alters its form during the process of setting, and the impression can be more accurately assembled while wet. I prefer also to assemble the fragments in the tray. I therefore take the card containing them immediately to the running water faucet, and here I thoroughly wash the tray itself and the several fragments, special care being taken to remove all loose particles, however tiny, as such pieces prevent the proper adjustment of the fragments. The impression perfectly assembled in the tray may be pressed together so tight that often all cracks are obliterated. The impression is then swabbed out with the bibulous paper swabs to remove excess of water, and it is finally put away to dry on its card.

Technique for Lower Impression.

The technique for taking a lower impression differs radically from that described for the upper jaw. Here we have new obstacles to meet; the tongue is present, and there is commonly a considerable flow of saliva to be reckoned with.

In speaking of upper impressions, I believe that I omitted to say that the teeth should be thoroughly cleaned and the gums well sprayed in advance. In using the spray it is my practise to direct the spray with one hand, while with the forefinger of the other I gently rub the surface of the gum, thus removing all mucus. This is even more essential when handling the lower, as a good cold spray will at least temporarily retard the flow of saliva.

In the upper jaw it will be remembered that the plaster was placed over the gums after inserting the tray. I recommend exactly the reverse in the lower. In my own office, where I can have the help of an assistant, I proceed as follows: The tray is barely filled with plaster, not overfull, and is placed on the stand in readiness. My assistant then places one finger in the left corner of the mouth and gently holds the cheek away, so that I can have good access to the buccal regions. In the illustration, Fig. 5, I show how this can be done working alone. Plaster is introduced with the little bone spatula and laid along the gums from the molars forward to the median line. Then the opposite corner of the mouth is stretched open and plaster introduced similarly, working from the molars toward the incisors, and being cautious to have the plaster flow evenly to avoid imprisoning air and creating air holes.

A common fault with lower impressions is that the lingual surfaces are often imperfect, especially back of the incisors, where too often we detect, when examining a model, that the operator had used his tray in such a manner as to bring the edge of it too close against the lingual gum margin. This may be obviated readily. After covering the buccal and labial surfaces of the gums and teeth with plaster, more plaster should be carried with the spatula along the lingual surfaces. The tray, with its additional proportion of plaster, is then quickly introduced and very gently pressed down against the plaster already in the mouth.

It will be observed that by this method the plaster is intro-

FIG. 5.

FIG. 6.

FIG. 7

FIG. 8

duced against the gums and teeth in a very plastic condition, but that at the moment of pressing the tray to place it will have just begun to stiffen by setting. Therefore, it is possible to press down the tray without forcing any great quantity of plaster from under the tray, which would thus induce irritation, excessive flow of saliva and possible gagging. Nevertheless, of course, plaster will escape from under the tray lingually of the incisive region, and also back behind the molars. If this excess of plaster be permitted to remain, it will cause irritation of the parts, inducing an excessive flow of saliva, which, mixing with the plaster, keeps it soft and messy. The tongue also being crowded, will become active, and by moving about, may wash the plaster away from some of the surfaces. It is, therefore, more imperative in the lower than in the upper, to promptly inaugurate a rapid and thorough cleaning up. First the cotton swab may be used as in the upper jaw, and with a delicacy of touch that plaster may be removed which will be seen to be escaping in the molar region and trickling toward the entrance to the throat. Then the paper swab is taken with foil carriers and the plaster immediately under the tongue is swabbed away, the dry paper picking up the plaster pieces by absorbing its moisture.

We have now reached a period of waiting for the plaster to set, and it is quite important to keep the mind of the patient occupied. There is a psychological fact here of importance. In spite of any expertness that the operator may acquire, there will be a greater quantity of excess plaster when working in the lower than when dealing with the upper jaw. As the plaster hardens small particles are apt to be broken off by the movement of the tongue and cheeks, and these particles irritate and induce excessive flow of saliva. Hence, the operator should keep constantly busied cleaning up. In handling a lower impression I often use up dozens of paper swabs. It will be of advantage also at times to use one or two swabs wet, thus, as it were, washing the parts; this must be quickly followed with dry swabs to soak up the mixture. It may seem to those that have not tried it that we but add to our troubles by introducing more water, but the opposite is true. Indeed, in very wet mouths I frequently introduce the saliva ejector after removing the excess of plaster and then use a cold spray very freely. This cold spray not only materially

aids in removing small particles of plaster, but seems to aid in abating the flow of saliva. At all events, one precaution is important. Before attempting to remove the tray, there should be absolutely no plaster in the mouth except that which will be essential to the impression. The mouth and the tray itself should be perfectly clean, with no excess of plaster nor small particles floating about. The tray is then carefully removed, the pressure being upward in the front of the mouth and downward over the molars. The tray is quickly set aside and the mouth again examined, when sometimes it will be found that the removal of the tray has fractured off small particles of plaster, which should be removed. Sometimes there will be larger pieces broken off between the cheek and buccal gum. These should be taken out and set aside on the waiting record card for replacement when assembling the impression. The impression is removed in the manner described for upper impressions, promptly assembled in the tray, and set aside to dry.

Impressions.

I will now take the liberty of showing you a few impressions and making comment thereon:

Fig. 6 is an upper impression, unretouched. It is shown just as it appeared after assembling it in the tray. Please note that the fractures do not show. That is because the parts were assembled and the edges brought together forcibly in the tray, while still wet, and fresh from the mouth.

Fig. 7 is an impression of the lower jaw of the same case, freshly assembled in the tray. I must explain here that my photographer, in painting in black backgrounds for me, mistook my instructions and painted out the handles of the impression trays. In this illustration, however, the edges of the tray are seen at the lingual aspect. This is a somewhat remarkably successful impression, the lingual surfaces back of the incisors and bicuspid being exceedingly perfect. Such a result could only be had where the tongue is quite still and the flow of saliva very slight. The imprint of the tongue is clearly seen and we note that it was drawn back in the mouth. This has slightly washed the plaster away from the lingual surfaces of the two last molars, which portions of the impression should be restored before pouring.

Fig. 8—This is an upper impression after it has been somewhat restored by retouching, especially along the back border.

Fig. 9—This is a retouched lower impression of the same case. It is introduced as being the complete antithesis of the lower previously shown. Here I had to deal with a very active tongue, which could not be kept at rest drawn back. Consequently, I was obliged to remove the excess plaster from under the tongue in order that it might have room to lie at rest extended forward. Nevertheless, by having introduced plaster along the lingual surface prior to placing the tray, and by not forcing the tray down too far, it is observed that a good impression of the lingual surfaces of the teeth and gums has been obtained.

It is often possible in young patients to remove the impression from the mouth without fracture.

Also, it is just as easy to use plaster when taking impressions for young children as when working for adults.

I call attention to the method of treating lower impressions by attaching a layer of wax across the lingual surface from one edge to the other. This prevents the plaster of the model when poured from rising up along the edges in the space occupied by the tongue, and facilitates separating and saves much work of trimming up this part of the resulting model.

Retouching Impressions.

Even the most skillful operator cannot invariably produce an absolutely perfect and symmetrical impression in all cases. There are many temperaments and many difficulties present in some cases that may be absent in others. Again, the operator is not always at his best. Some days are more trying than others; a man may be ill enough so that really he should be in bed, and yet may be at work because professional duty calls. These and other reasons may cause one occasionally to obtain an impression not so perfect as he may desire. It is manifestly better to repair this if possible rather than to cause the patient the annoyance of a second impression. Even a moderately bad impression may be made fairly perfect by skillful retouching.

By retouching is meant the restoration of missing parts of the impression by the additions of plaster. This involves two

things: an intimate acquaintance with the appearance of the hard and soft tissues in intaglio, and the ability to restore missing parts of the impression by adding plaster. This adding of the plaster is done with small camel's hair brushes, and the method I believe originated with Dr. Norman W. Kingsley.

The requisites are several camel's hair brushes of various sizes, from very small to fairly large, a bowl of fresh water and fresh plaster, preferably of the same quality as that in the impression or model, though this precaution is more important in a model which is to be kept than in an impression, which, of course, will be destroyed. We likewise need one or more saucers.

A little water is poured into the saucer and a small mass of plaster placed just at the edge of the water. The plaster is then mixed in the water with the camel's hair brush and carried with the brush to the impression or model to be retouched. Small air holes are filled in with the smaller brushes, while large masses may be added, "painted on" layer after layer, with the larger brushes. The model or impression should have dried for at least twenty-four hours for successful retouching, as it is necessary for the dried-out plaster to quickly absorb the moisture of the newly added masses.

In retouching, air holes may be filled in, a fracture obliterated and the imperfections at the back of the impression and in the molar regions restored. Note also particularly, that plaster can be added outwardly along the buccal borders of the impression. This increases the width of the impression at these parts and is quite essential to the making of a good model, as will be made clearer when discussing the trimming of the models.

Varnishing.

It is not easy to explain just how the impression should be varnished. Previous writers have been charged with not stating exact proportions of the alcohol and the varnish. But exact proportions cannot be given, because varnishes differ, and more especially because the evaporation of the alcohol constantly alters the relations. I can only give general directions. After many experiments I find that I obtain my best results by not applying any varnish until the impression has dried for at least one day. I use shellac varnish so thin that the dried surface of the plaster ab-

FIG. 9.

Before and After Retouching

sorbs it rapidly, and I can usually apply two coats of this very thin varnish without "gobbing up" the surface. When this is thoroughly dry, say, in about fifteen minutes, the sandarach varnish is added. This also should be very thin. I apply it with a fairly large brush, well filled, and "flow" it over the parts that overlie the soft tissue: the gum and roof of the mouth.

I do not allow this varnish, however, to flow into the impressions of the teeth, to prevent which I hold the impression upside down, applying the varnish so that it flows away from the teeth parts. The impressions of the teeth are then carefully varnished with a very small brush charged with very little varnish. Watch any professional painter varnishing a door and it will be seen that his brush is never so filled that the varnish trickles from it in all directions. He obtains his best results by lightly coating the parts; repeating if needed. I have three bottles. One for shellac, one for sandarach, and one with plain alcohol, in which the brushes are thoroughly washed after each use. By this means the brushes are always clean and soft, and the same brush can be used for both varnishes.

Pouring the Models.

Filling the impression, or pouring the model, as it is usually called, is a simple procedure, and yet it is often imperfectly done. If the previous technique is followed the varnished impression will be at least two days old, and consequently so dry that if the plaster for the model were poured into it, the impression would soak up the moisture from the new plaster, producing a crumbly surface, with much imprisonment of air and consequent air holes. The impression, therefore, should be soaked in water before pouring. This does not mean that it should be saturated. Too much water added at this time will cause the plaster of the impression to so deteriorate that it will not fracture properly when separating, but will be mushy or chalky in consistency. It should be just wet enough to properly receive the new plaster. It may be set in water for half a minute; not longer.

Dr. Norman W. Kingsley never varnished his impressions at all. His method was to add a little water-color paint (usually red) to the water used in mixing the impression plaster. This gave the impression considerable color, and differentiation be-

tween it and the model was easy. Then as a separating medium he would use soap on a shaving brush. This soap should be thoroughly applied and then as thoroughly removed. It is well to allow the water from the faucet to run into the impression, and at the same time brush out all "soap bubbles," thus avoiding air holes. I make use of this medium for separating when treating impressions for working models, which must be poured without delay, except that I no longer color the impression water, as for my working models I use "Sump," an investment compound which contains color. I believe it is much better to use soap as a separating medium when the impression must be poured while it is fresh, rather than to attempt to varnish a "green" impression. As this often results in the varnish peeling off and adhering to the model, in which case it, the varnish, hinders rather than helps the separating. Some recommend the use of soap even in varnished impressions, but if used at all, it should be used cautiously, as the alkali in the soap will cut the varnish.

In pouring the impression mix the plaster quite thin, almost as thin as milk, and drip it from the end of the spatula in the molar region.

The surface of the impression should be wet enough at the time so that the thin plaster will flow freely into and out of the tooth impressions. Let me say, parenthetically, that I use for mixing plaster, knife-shaped spatulas, made of some composition similar to platinoid. Or it may be German silver (whatever that is). At all events, I have discarded the use of steel, because formerly I often noted rust-colored discolorations on my models, which no longer appear, since abandoning the steel knife.

After the plaster has flowed into all the tooth impressions I then tip the impression up so that the plaster will flow away from the tooth parts towards and over the roof, allowing the excess to drip back into the plaster cup (Fig. 10). By this time the plaster will have begun to set and the operator must work rapidly. The impression should be examined, and while no air should have been imprisoned in the tooth impression, should any such bubbles appear, they should be pricked with a small camel's hair brush and the impression then quickly filled with the setting plaster. At this stage I use a ferrotype plate, which is a piece of metal, coated with black enamel, used by photographers for mounting prints. Plas-

FIG. 12

Fig. 10

Fig. 11

ter separates from it easily, and it is readily sponged clean. The impression being filled, an additional quantity of plaster is placed on the ferrotype plate, the impression turned over and placed upon this second mass, and the plaster trimmed up to proper shape with the spatula (Fig. 11). There is but one detail of importance to be noted at this point, and that is, that sufficient plaster must be added to make the model quite wide at the back corner, as seen in the illustration in which the back part of the poured model is presented. This will be found advantageous when trimming up the models.

Separating the Impressions from the Model.

To separate the impression from the model I find it best to allow twenty-four hours to pass when dealing with record models, though working models may be separated as soon as the plaster has sufficiently hardened; often within an hour of pouring.

In dealing with a record model, grooves are cut to facilitate the separation. One groove midway between the margin and the upper surface of the impression, along the buccal and labial surfaces. Another at about the center of the occlusal surfaces of the teeth, and vertical incisions at right angles to these. A section at the posterior part of the buccal area is pried off first. Then a second piece further front, and so on until the entire buccal and labial surfaces of the teeth are disclosed. Then the roof part may be removed, usually entire, in the upper jaw, though it must be taken off in sections in the lower. Pressure should be used so as to press these parts away from, rather than toward, the teeth. Finally, the parts overlying the gum may be pried out, which is usually easy, as these parts were fractured in the original removal of the impression from the mouth.

Trimming the Models.

The trimming up of the models is best done at the time of separating, as usually the plaster is then of just the proper consistency to cut with knife, plane, or file. But if for any reason the trimming of the model is delayed, the plaster will harden, and must be made soft again. The model should not be dipped in water. A very little water should be placed in a saucer and the model set in it. The water will be absorbed by capillary attrac-

tion, and can be seen to rise as it enters the plaster. As soon as the moisture has reached the region of the gum, the model should be removed from the water, as any excessive wetting will always injure the model.

In trimming up a set of models I first roughly trim the sides in accordance with the well-known angle plan. I then undertake to establish what may be termed a base line. For this purpose I have adopted a purely dogmatic method, which perhaps has no basis in scientific reasoning, but which serves the purpose well enough. First, I spread a pair of compass points one inch apart. In very small mouths it may be one-sixteenth of an inch less and in larger mouths one or two-sixteenths more. But most often it is one inch. I place one point of the compass immediately in line with the buccal groove of the first molar, just at the gum margin, and with the other point I make a prick into the plaster. This is done on both sides. Then the compass points are closed one-sixteenth of an inch, and similar marks are made, measuring from the gum line at the center of each cuspid. The object of shortening the measurement in this way is to slightly elevate the base line in the molar region. With a sharp knife these pricks or dots on the plaster are united by cutting a line, and this cut line is continued entirely around the base of the model. The model is then turned bottom side up and the plaster above the line is cut away on a bevel. This renders it easy to cut away the excess plaster without encroaching upon the established base line, but when the base line is almost reached the knife may be discarded for a Stanley plane, a small metal carpenter's plane, shown in several of the illustrations. This is better for the bottom and top of the models than the Angle plane, being wider, though the Angle plane will be more useful along the sides. After planing the base fairly smooth it should be made smoother still with a coarse file. At this point it is well to repeat the measurement to be sure that the base line has been established properly, as upon this will depend the good appearance of the two models after the upper model has been trimmed to coincide with the established base.

The upper model is now approximately trimmed along the sides and placed in proper occlusion with the lower model. If a previous set of models of the case has been made, these should be taken from the cabinet and the new set made to conform to the

first set in height. If it is the first set of models then a set of models of a similar case may be used as a guide. But in any event, the artistic requirements demand that the top of the models should be at such a height that the part above the gum in the upper model should be sufficient to balance well with the similar part of the lower model.

The desired height of the models having been determined, I use a device presented to me by Dr. Luckey, Jr., of Paterson, for marking the upper line. This device consists of a base and an upright rod on which a pencil carrier travels, which carrier can be fastened at any desired height with a set screw. With the pencil fastened at the desired height a line is inscribed entirely around the upper model. I find this device very convenient, but in its absence the same result may be obtained with a pair of compasses, one point resting on the table and the other inscribing the mark on the models.

The excess of plaster above this line is then cut away, as was the excess below the base line of the lower model, and the resulting surface is made smooth with plane and file.

The back of the lower model is then trimmed, so as to be at an equal distance from the posterior surface of each molar. The upper model is then again placed in occlusion with the lower, and the back of it is trimmed away and filed so as to conform absolutely and lie in the same vertical plane with the back of the lower model. The two models are held together and the back filled. The posterior corners are then cut away, symmetrically, and both models filed. The side is then cut away so that the anterior terminal of this buccal plane falls in line with the center of the upper cuspid and the front plane extends from this angle to the median line. If possible, the artistic parts of the model should extend sufficiently out beyond the anatomical parts, so that the two models may be held in the hand in occlusion and their sides filed to coincide, without danger of injuring the teeth during the filing (Fig. 12). It is for this purpose that the impressions are built out at the buccal borders, as described in the directions for retouching.

The sides of the models may be squared up so as to rise at right angles from the base by setting the model upon a large glass cube and using the Angle plane, set to cut fine, and handled in

such a way that the plane rests partly on the glass and partly against the sides of the model. The sides may then be further perfected by using a very fine file in the same manner. The models we have been working on are seen in Fig. 13.

Final Finishing, Retouching, and Repairing of Models.

Models thus trimmed up are set aside till thoroughly dried. They may then be retouched, as described in relation to treatment of impressions. Air holes may be filled in, missing particles broken from teeth built on, and teeth broken off may be replaced. Two methods of replacing teeth may be described. If the missing part be not lost it may be carefully fitted back into position and so held, while with a sharp bistoury a little of the plaster is cut away along the lingual joint of the break, and this filled in with plaster on the smallest brush. If the part broken off be lost a small impression of the natural tooth may be taken in Detroit modeling-compound, and a new plaster tooth procured in this manner. Then the broken tooth should be cut away from the model, carefully preserving the gum margin. The newly procured plaster tooth should be trimmed up so as to just set in the socket cut in the model, and may be attached to it with the camel's hair brush and fresh plaster.

Should the plaster model show slight imperfections about the teeth and gums, the model should be immersed in water for about five seconds. This will soften the surface sufficiently to enable the operator to remove any excrescent particles of plaster and perfect the outline of teeth and gums. This is best done with dull instruments. I use a plain, right-angled burnisher. If a polish is desired it may be obtained by dusting talcum powder on the surface of the model while it is slightly moist, and rubbing it in with the finger, dusting off the excess with a brush.

Study Models and Working Models.

Study models are models taken during the progress of the correction of malocclusion, and are made with the purpose of observing the existing conditions better than they can be seen by examination of the mouth itself. Usually some sort of appliance will be in position, which the operator does not desire to remove. The impression is taken with these appliances in place.

FIG. 13

FIG. 14

By working models I mean models taken with molar bands, or other bands fitted to the teeth, the models being taken with the purpose of soldering other attachments to these bands, as, for example, when molar clamp bands have been fitted and the buccal tubes are to be soldered to them.

The technique of taking these impressions differs considerably from that described for record models. In the record models, as we have seen, we desire to reproduce in the models, not only the teeth, but the gums and vault as well. In study models and working models all that is really required is an accurate reproduction of the teeth, with, of course, a little of the adjacent soft tissues. We may therefore hasten the operation by adding a little salt to the water when mixing the plaster. The plaster itself may be stirred, until a distinct stiffening is felt. This indicates that the setting process has begun and consequently, the impression will be in the mouth but a very short time. Under these circumstances, of course, everything must be in readiness for very rapid work. Very little plaster is placed in the tray—just enough to reach the top of the outer edge of the tray and not quite fill the trough, none at all extending over the vault.

Unlike the method previously described, the tray is carried at once to place. It may surprise some to see how good an impression may be obtained with such a small quantity of plaster.

Where molar clamp bands are in position, even less plaster may be used, as it is not desirable to have much plaster set fast about the lingual screws of the bands. Usually it is best in the molar region to have the plaster only in the deeper part of the tray and up along the buccal sides. In Fig. 14 we see an impression of a lower, with molar clamp bands placed in the impression. In the molar regions the lingual flanges of the tray were left entirely free of plaster. In the result we see that the plaster did not entirely encompass the lingual screws, thus interfering with removal of the impression; nevertheless, we observe that perfect impressions of the teeth were procured.

Impressions taken for the making of study models should be permitted to harden in the mouth, and are removed in sections just as when making record models. Impressions for working models may be treated in the same manner, but in consequence of the lingual screws of the clamp bands, it is perhaps as well to

remove the impression as soon as the plaster remaining in the cup is hard enough to fracture, and with a little gentle rocking the impression may be removed entirely at this stage of the setting.

The separating of the impression from working models is much simpler than when making record models and it may be done usually within thirty minutes of pouring. If the model be poured with Sump, which is of a pinkish color, the procedure is as follows: After removing the tray, the white plaster of the impression is sliced away horizontally with a sharp knife, in thin layers, until the cusps of the teeth just show, the pink of the Sump model rendering this very simple. This may pare off a little of the cusps of the teeth, but that is not of any consequence. The buccal and labial sides of the impression are now very readily pried off, and then the rest of the impression.

A model of this character gives us a reproduction of the teeth with bands in place, and attachments are readily soldered on while still in place on the model. Such models are useful in attaching buccal tubes and fitting the regulating bow at the outset of the case, and also for making retainers at the end of treatment. This method of impression taking and model making is equally applicable to all kinds of prosthetic work, including crown and bridge work.

**X RAY MEASUREMENT OF THE PERMANENT TEETH
BEFORE ERUPTION TO PROVIDE FOR EARLY
REGULATION OF THE DENTAL ARCH¹**

BY SINCLAIR TOUSEY, A.M., M.D.

My first work in this connection was undertaken in 1906 at the suggestion of my friend, Dr. Henry W. Gillett. A series of radiographs of the unerupted permanent central incisors was shown at a meeting of the New York Institute of Stomatology in that year with a promise to complete my report when the permanent teeth should have erupted. A number of the children have now been traced and the actual measurements have been compared with those predicted by the X ray.

The practicability of radiographing the teeth of children five or six years of age is shown by my own series of thirty children, with only a single refusal.

Fig. 1 shows the unerupted central. The caliper square graduated in hundredths of an inch and with a screw adjustment is used in measuring the width of an unerupted tooth in a radiograph. It is easy to read the $\frac{1}{100}$ -inch graduations with a magnifying glass.

The desirability of knowing the size of the arch required is shown by the number of children whose permanent teeth come in crowded and out of alignment, or are delayed in eruption through malposition, or some of which are missing altogether. Actual measurement of the temporary teeth will give no information as to absence or malposition of the unerupted permanent teeth. And my cases show that actual measurements of the temporary do not correspond with the actual measurements of the permanent teeth made after their eruption.

The presence and position of every tooth may be determined, but the most important measurement, in hundredths of an inch, is the greatest width of the unerupted permanent central incisors, the upper ones being of chief consequence.

These measurements show at once the practical width of the

¹ Read before Orthodontia Section of First District Dental Society of New York.

unerupted centrals. Mathematically exact measurements would require a geometrical calculation, since the unerupted tooth is at a certain distance from the film, and consequently its shadow image is a very little enlarged.

This calculation shows that about one-thirtieth of the width of the shadow of the unerupted tooth should be deducted to obtain the actual width of the unerupted tooth in a radiograph made upon a horizontal film, according to the author's present technique.

Another detail which requires the closest attention is in the measurement of the width of the shadow, so as not to include the penumbra, which even with the X ray is present when the object is not in contact with the surface upon which its shadow is cast. The very small diaphragm in the author's present technique makes it possible to secure clear images of the unerupted teeth, with very little uncertainty as to the width of the true shadow.

The direction of the tooth casting the shadow is of vital importance; a correct radiographic measurement being only possible when the tooth directly faces the X ray tube. One of the central incisors will usually do so if the tube is placed in front of the patient without too great an effort to get it absolutely in the median line. The tooth, the occlusal edge of which is squarely at a right angle with its long axis in the radiograph, is the one to be depended upon for a correct measurement. This is one of the particular advantages of the author's method of casting the shadow of the teeth upon a film placed horizontally in the mouth. The curve of the dental arch is shown, and it is easy to see whether a tooth directly faces the X ray tube and at what angles the others are placed. The shadows vary like those of a visiting card held vertically to a sheet of paper and turned toward or somewhat away from a lamp which is at an elevation of 45 degrees from the plane of the paper. In some cases the radiograph shows that both unerupted centrals are turned so far to the sides that an exact measurement requires another radiograph with the tube sufficiently to one side. This revelation of the sharp angle between the centrals is important as indicating narrowness of the dental arch.

It is the author's custom to make accurate measurements of the width of each temporary upper and lower central when making the radiographs of the unerupted permanent centrals. Know-

FIG. 1.

FIG. 2

FIG. 3

ing the actual measurement of the temporary teeth and applying our caliper square to the X ray image of the same teeth, one soon becomes able to measure the latter accurately.

The radiograph showed the entire absence of the germ of one of the lateral incisors in one of the cases where radiographic measurements were made. The author has made many hundreds of radiographs in older children and adults to determine the presence or absence and the position of unerupted teeth which have caused years of uncertainty. This would all be obviated by an X ray examination at about the age of six years.

Having made measurements of the unerupted permanent central incisors the question naturally arises as to how nearly accurate these measurements are likely to be. This is answered by the table which follows. In all these cases the radiographic measurements have been made from films which were marked for identification at the time they were taken, and which are still available for demonstration. The difference between the radiograph of the unerupted tooth and the actual width of the same tooth measured some years later after eruption in no case exceeds $\frac{1}{100}$ inch. This variation is within the limits of possible error in making the actual measurement after eruption, and is well within the limit of accuracy required for practical work in orthodontia. The children themselves are available, as well as the original films, if the accuracy of the figures needs corroboration.

This table includes all the children in whom I have the original radiographs of the unerupted and the actual measurements of the same teeth after eruption. It does not include a large number of radiographic measurements in children whom I have not been able to secure for measurement after eruption.

The table also relates to a child in whom one upper central was erupted and the other unerupted at the time the radiograph was made. The radiographic measurement of the unerupted tooth was the same as the actual measurement of the erupted one.

Practical Application of the Method.

The upper arch is the one which it seems most important to determine, and it is practicable to measure the widths not only of the central incisors, but also of the laterals and canines. The cases so far examined show that an arch calculated from the width of

the upper permanent unerupted central incisor is the correct one for the purpose in hand.

This superior arch is based upon Bonwill's, Hawley's, Bogue's, and McNaughton's work.

In my cases the curve of the temporary arch has been reproduced in the permanent arch. In the case of Miss S. R. the temporary arch corresponded to one based on upper central incisors, .30 inch in width. The temporary upper centrals measured .23 inch and the unerupted permanent upper centrals .36 inch. Five years later the permanent arch is much too narrow and corresponds, as did the temporary arch, to upper centrals only .30 inch wide, Figs. 2 and 3. This case is a striking example of the benefit which might have been secured by early regulation, and of the fact that in such a case spontaneous expansion of the arch is not to be depended upon.

In the case of Miss C. T., the temporary arch corresponded very well with the curve based upon a width of .36 inch shown by the radiograph of the unerupted permanent upper centrals. But the permanent arch is deficient in that the centrals are placed at a re-entrant angle and one entire side needs lateral expansion. The radiograph of the unerupted upper centrals showed this indentation of the upper centrals. This was only slightly foreshadowed by that of the temporary centrals. This might have been corrected by moving the temporary teeth.

PERMANENT CENTRAL INCISORS MEASURED RADIOGRAPHICALLY BEFORE ERUPTION AND ACTUALLY SOME YEARS LATER AFTER ERUPTION.

(Numbers are Hundredths of an Inch.)

<i>Name.</i>	<i>Tooth.</i>	<i>Radiograph Unerupted.</i>	<i>Actually After Eruption.</i>
M— S—	Left Upper Central	39	38½
C— T—	Right Upper Central	36	36
C— T—	Right Lower Central	22	22
C— L—	Right Upper Central	34 oblique	33
G— W—	Right Upper Central	29	29

(Table of Measurements Continued)

<i>Name.</i>	<i>Tooth.</i>	<i>Radio-graph Unrupted.</i>	<i>Actually After Eruption</i>
F— F—.....	Right Upper Central	35	34
S— R—.....	Left Upper Central	36	36
J— S—.....	Left Upper Central	32	32
J— S—.....	Right Lower Central	21½	22

WIDTH (IN 1-100 INCH) OF ERUPTED AND UNERUPTED PERMANENT UPPER CENTRALS AT THE SAME DATE.

<i>Name.</i>	<i>Tooth.</i>	<i>Unrupted Radio-graph.</i>	<i>Erupted Actual Measurement.</i>
N— F—.....	Right Upper Central	..	35
N— F—.....	Left Upper Central	34 oblique	..

THE RESTORATION OF NORMAL OCCLUSION BY THE GENERAL PRACTITIONER¹

BY J. LOWE YOUNG, D.D.S., NEW YORK CITY.

Normal occlusion of the teeth is not a new idea, but previous to the writings of Dr. Edward H. Angle on the correction of malocclusion, the necessity of restoring normal occlusion as a result of orthodontic treatment was not known by the dental profession. This was the thought which was the basis of the classification and diagnosis of malocclusion, and which immediately placed orthodontia upon a scientific foundation, enabling it to advance with such rapid strides during the last ten years.

Now, in order for the orthodontist to correct malocclusion, he must of necessity have a clear and definite understanding of this ideal condition which he is attempting to restore. Thus it is that normal occlusion is the one supreme picture which the orthodontist has in his mind, the beginning and the end of his anticipations of treatment, the guide which governs the daily progress of correction of malocclusion, the standard in occlusal relations which, above all, it is desirable to obtain. (Figs. 1, 2.)

Examined analytically, this condition of normal occlusion exhibits first, normal structure of the teeth, collectively and individually, and second, normal function of the teeth, collectively and individually. Normal structure of the teeth will imply the perfection of form of the individual teeth and of each dental arch. Normal function will imply the normal occlusal relations of the inclined planes of the cusps of the individual teeth.

With this conception of normal occlusion it will be apparent that the loss of one tooth or even one cusp of one tooth, or to be more exact, the loss of any portion of the mesio-distal diameter, will to just that degree destroy both normal structure and normal function. It is also apparent to those who have seriously studied this question that it is of equal importance to properly restore the mesio-distal diameters of the deciduous molars where fillings have to be inserted on their proximate surfaces.

¹ Read before the American Academy of Dental Science, Boston, Mass., April 3rd, 1912. See discussion, page 250.

FIG. 1.—Buccal Aspect.

FIG. 2.—Lingual Aspect.

FIG. 3.

FIG. 4.

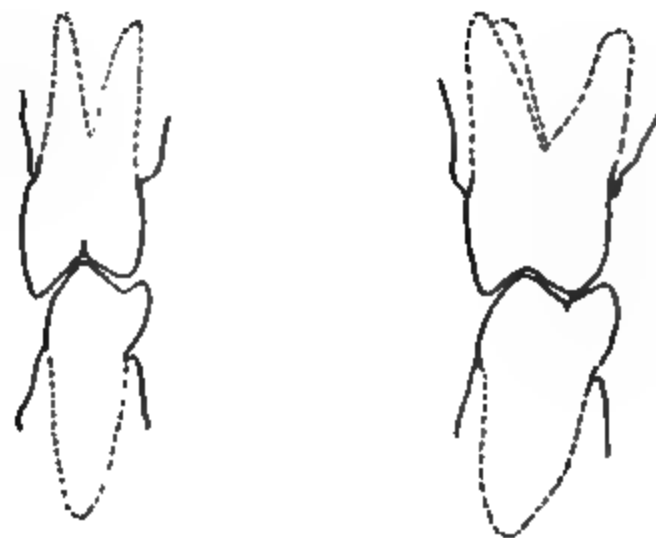


FIG. 5.

Did it ever occur to you that the orthodontist often works for years to build up this normal occlusion only to have it pulled down in a day by the ruthless extraction of a single tooth, or by the lack of restoration, by the general practitioner, of cusp contour, or proximate contact in making fillings or inlays?

It would seem, therefore, that the dentist must share the responsibility of the orthodontist in emphasizing the importance of normal occlusion by preserving it at all times and at least by not destroying it.

Hence, if the general practitioner is to properly restore any part of the dental apparatus, he, like the orthodontist, must have in his mind's eye the forms, surfaces, and positions of the dental organs when normal.

The value of proximate contact, the proper occlusion of each cusp, the size of each fossa, and the direction of each sulcus, should be known to him who aspires to restore or recreate these anatomical forms.

In this brief paper it is my purpose to call your attention especially to the one phase of normal occlusion represented in the relation of the occluding surfaces of the teeth of one dental arch to the same surfaces of the teeth of the opposing arch.

At the same time I wish to appeal to you to use the same standard of normal occlusion as a guide in your work that the orthodontist uses, so that when you examine a set of plaster models made from accurate plaster impressions you will not only consider the teeth of one arch in their mesio-distal and bucco-lingual relation to those of the opposing arch, but that you will note the position of each cusp of each tooth and its relation to the cusps of the teeth of the opposing arch. For, when carefully considered and thoroughly understood, their proper reproduction becomes of the utmost importance to the general practitioner and the prosthodontist, as well as to the orthodontist.

It is my further purpose to direct your particular attention to the grooves, the pits, the ridges, and the inclines found on the occluding surfaces of the teeth, and to consider the possibilities of their reproduction in your work. These features can be best studied from the natural teeth wherever it is possible to procure a skull having all the teeth in normal occlusion.

Those of you who purpose to seriously study these organs

will do well to have Dr. Black's "Dental Anatomy" along with your anatomical specimens. It is really wonderful how carefully each anatomical landmark is defined by this writer. To attempt to go into details, as he has done in describing the occlusal surface of each tooth, would make this paper too long, but it is deemed advisable to quote from his Fourth Edition what he says of this surface of the lower first molar. This tooth has been chosen because of its great importance to the orthodontist in his work. (Fig. 3.)

"The occlusal surface has five developmental grooves—the mesial, buccal, disto-buccal, lingual, and distal—which divide it into five developmental parts, or *lobes*. These are the mesio-buccal, disto-buccal, mesio-lingual, disto-lingual, and distal lobes; each bearing a cusp of the same name. The *mesial groove* runs from the central fossa over the mesial marginal ridge to the mesial surface. On the mesial marginal ridge it is usually a fine line which is soon obliterated by wear. Occasionally this is divided into two branches, with a small tubercle on the mesial marginal ridge between them. In many examples there is a supplemental groove which rises from the mesial groove at about the center of its length, and runs toward the mesio-buccal angle. This is the mesio-buccal triangular groove. It divides the mesial marginal ridge from the triangular ridge of the mesio-buccal cusp. More rarely there is also a similar groove running toward the mesio-lingual cusp. When these are deep they form a mesial supplemental fossa. The *buccal groove* runs in a deep sulcus from the central pit to and over the buccal marginal ridge to the buccal surface, and divides the mesio-buccal from the disto-buccal cusp. The *disto-buccal groove* also runs disto-buccally from the central pit over the buccal ridge, more or less near the distal angle, as the distal cusp is large or small. It divides the disto-buccal lobe from the distal. The *lingual groove* runs from the central pit in a deep sulcus to and over the lingual marginal ridge onto the lingual surface and divides the two lingual lobes. The *distal groove* runs distally over the distal marginal ridge and divides the disto-lingual lobe from the distal. Frequently this groove can be traced some distance toward the gingival line on the distal surface. The mesial and distal grooves form a line traversing the whole extent of the occlusal surface, from mesial to distal, in the center of which a V-shaped deflection is formed with its point to the lingual, the

base receiving the point of the triangular ridge of the disto-buccal cusp.

“ In most examples the *central fossa* occupies all the occlusal surface within the circle of the summit of the marginal ridges, though occasionally one or more supplemental fossæ are divided from it by high triangular ridges running down from the cusps. The surface of the fossa is made irregular in most of these teeth by deep sulci on the lines of the grooves, separating the cusps and triangular ridges.

“ The occlusal surface of the lower first molar has *five cusps*, one on each of the *five lobes*, or three on the buccal marginal and two on the lingual marginal ridge. These cusps are formed by the grooves previously described (par. 98), which pass over the ridges in depressions of variable depth, thus subdividing the crests of the ridges into obtuse elevations. Usually these are not so high and prominent as the cusps of the upper molars. The *mesio-buccal* is the largest and strongest of the buccal cusps, and occupies rather more than one-third of the buccal marginal ridge. From its crest a triangular ridge runs down centrally to the junction of the mesial and buccal grooves, and is divided from a similar triangular ridge from the mesio-lingual cusp by the mesial groove. Where these two ridges are high, they form, in conjunction with triangular grooves between them and the mesio-marginal ridge, a mesial supplemental fossa. The *disto-buccal cusp* is of less extent from mesial to distal, but has a longer triangular ridge, though not so high, which ends in the point of the V-shaped deflection of the mesial and distal grooves, or at their junction.

“ The *lingual cusps* are about equal in size and height (perhaps the mesial is a little the higher on the average). They have strong triangular ridges which terminate in the angles formed by the junction of the lingual grooves with the mesial and distal grooves in the central pit.

“ The *distal cusp* occupies the distal portion of the buccal ridge, and forms the disto-buccal angle of the occlusal surface. It is the distinguishing mark of the lower first molar, being but very rarely absent in that tooth and never present in the lower second molar. It is the smallest of the five cusps and varies most in its relative size. In some examples it is almost or quite as large as the disto-buccal cusp. In others, especially in small and poorly

developed teeth, it may be reduced to a mere tubercle, occupying the buccal portion of the distal marginal ridge and the immediate disto-buccal angle. The central incline of this cusp is commonly nearly flat, but occasionally has a rounded crest. It ends in a point at the junction of the distal and disto-buccal grooves.

“In this tooth there is often a deep *pit* at the junction of the mesial, distal, and lingual grooves. Less frequently there is also a pit at the junction of the mesial and buccal grooves and at the junction of the distal and disto-buccal grooves. The grooves are often *fissured* for a short distance from the pits, especially in the deeply sulcate lingual groove. In some very poorly-developed teeth, fissures may be found in any part of the grooves.” (Fig. 4.)

When we consider how much more we get out of this quotation, with the slides before us on the screen, it must be apparent to everyone that in studying this work of dental anatomy we must do as Dr. Black has advised and have several specimens of each tooth before us as we read the text. Great benefit may also be derived by careful consideration of plaster models, made from accurate plaster impressions such as the orthodontist is in the habit of making. By means of these models the relation of the cusps, fossæ, sulci, and ridges of the occluding surfaces of the teeth of one arch to the same surfaces of the teeth of the opposing arch can be studied from the buccal, lingual, and occlusal views.

My object, therefore, in bringing this phase of occlusion to your attention has a more definite purpose than the subject as it is related to the work of the orthodontist, and yet it is of great importance to him, because it bears such an important relation to his most difficult problem—namely, the retention of teeth that have been in malocclusion. Frequently the result of several years of most painstaking efforts of the orthodontist is thwarted by improper fillings and inlays. It therefore appears that if in any way we can help each other in maintaining normal occlusion, we should do so by trying to work in harmony.

The deficiency of these fillings and inlays to which I refer, is due entirely to the failure of the operator to reproduce the fossæ, sulci, grooves, ridges, and the mesio-distal diameter as they are found in the natural teeth.

That it is Nature's plan to have cusps of a proper length and fossæ of a proper depth, and sulci of a certain form, and



FIG. 6

FIG. 8.

FIG. 10.

FIG. 7

FIG. 9.

ridges of a definite shape in order to make the dental apparatus efficient, a careful study of these occlusal surfaces in their natural state will show conclusive proof.

Here, let us note, that the bottoms of the grooves when normal are never reached by the cusps of the teeth of the opposing jaw. (Fig. 5.) In this respect the old-fashioned millstones were patterned after the grinding surfaces of the teeth, and whenever the miller allowed these stones to become dull, so that the grooves were very much reduced in depth, though not entirely obliterated, the grist was invariably spoiled. In like manner, whenever the dentist fails to reproduce the grooves, pits, and ridges in restoring lost portions of the occluding surfaces of the dental organs, does he not interfere with their efficiency for masticating food?

Now, with this idea of the normal occlusal surface in mind, let us, by way of contrast, consider the meager, inefficient manner in which the average practitioner attempts to reproduce them, and see how far short he falls from the ideal in this respect.

By studying the models of this case you will see by examining and comparing the occluding surfaces of the teeth before and after the inlays were inserted how lacking are the fossæ, sulci, grooves, pits, and ridges in these otherwise beautiful inlays. (Figs. 6, 7.) You will observe almost flat surfaces and in many cases over contour on the occluding surfaces. In several places the cusp of a tooth in one jaw strikes too hard on the inlay in the opposing jaw. Indeed, it is a wonder that more teeth are not split where fillings and inlays are left in such a condition.

These inlays were made by as conscientious an operator as I have ever known. I am satisfied that he would do just such work as this for his own child and feel proud of it. The child complained of not being able to masticate food as well as she formerly could. I have seen plaster models of many cases, though less marked, showing these same defects.

The question then naturally arises, how to reproduce these anatomical landmarks found on the occluding surfaces of the teeth so as not to interfere with their efficiency when restoring portions, or all, of their occluding surfaces.

Previous to the introduction of cast gold inlays it seemed almost impossible, and very improbable, that this would ever be done. With the perfection of this process it appears to be quite

within the range of the careful, conscientious operator to so reproduce each anatomical landmark in restoring any, or all, of the occlusal surface of a tooth, that detection of these restorations will be almost impossible when examining plaster models made from accurate plaster impressions of such teeth.

Fearing that you will accuse me of criticising your efforts without offering any solution to the problems involved I am compelled to offer some suggestions as a remedy for these evils, and in doing so I am venturing on new ground, as I have never had any practical experience in making cast gold inlays.

I am not very familiar with the technique of this work, but I understand there are two methods employed—namely, the direct and the impression method—but in either case the occluding surface of the inlay should be made to represent the natural shape of the tooth that it is to occupy before it is cemented in place. I have seen enough of this work done to know that it is not a very difficult matter to reproduce these sulci, pits, and grooves in wax. I am also quite well aware that if the sprue wire is placed in that portion of the wax in which the grooves have been reproduced when the cast is made, some of the grooves are obliterated. Therefore, it is advisable to have the sprue wire as small as is practical, so as to obliterate as few of the grooves as possible. This only applies when making inlays for simple occlusal cavities.

Furthermore, after the cast is made, the grooves and pits will be found somewhat rough. If an attempt be made to smooth up these grooves with a plug finishing burr or stone of any description the finished inlay will present grooves and pits with round bottoms rather than V-shaped grooves, as found in the natural teeth. These grooves and pits can be smoothed and polished without obliterating the sharp V, as will be shown by some specimens. In some of these the V is exaggerated.

Other and more simple methods will undoubtedly be employed by different operators, but the method used in preparing these samples will be described.

Where the impression method was used the die was fastened to a suitable handle with engravers' wax. In doing this it was found advisable to have at hand a glass of ice water so as to chill the wax as soon as possible and thus prevent the mercury being driven out of the amalgam with the heat of the wax. After dry-

ing off the metal die a little sticky wax was heated and dropped into the cavity, the inlay warmed and pressed to place and chilled again.

In this way the inlay was so held that it was possible to smooth and polish the grooves and pits where they had been properly reproduced in the wax, and where not, it was found possible to cut them in the inlay. Steel engravers of various shapes were used in doing this, for by their use sharp grooves such as are found in the natural teeth can be cut in the gold, and if properly done these grooves will require very little burnishing and polishing to make them perfectly smooth. The inlay was then warmed so as to remove it from the metal die, and the wax was cleaned off with chloroform. A needle-point flame of a small blowpipe was used in warming the inlay, being most careful not to heat the amalgam die, which would cause the mercury to escape and be absorbed by the hot gold.

Where the direct method is used the inlay can be fastened direct with Bottom wax, care being exerted to have all thin edges of gold well supported with wax, so that the shape of the inlay will not be changed by using the steel engraver.

There is no doubt that it is more difficult to properly reproduce the anatomical shape where the inlay is mounted in the wax alone than where it is set in a metal die of the tooth. But with a little care, in either case it is possible to reproduce these grooves.

Since writing the above it has been found that it is quite practical to reproduce every minute anatomical landmark of the occlusal surface of a tooth in wax and so cast the same that the use of steel engravers will not be required at all. (Figs. 8, 9.)

The inlays that will now be shown were made by request, in duplicate, by some well-known operators. It is not the intention to criticise these, other than where they are deficient on the occluding surface. The first inlay of each case was finished by the operator who made it as if he were going to cement it in the tooth. The second one was left as it was cast. These have been treated as described above, so that you may compare them.

In some of these you will observe that it was necessary to add to them with gold solder, so that the ridges and grooves could be reproduced to conform to the anatomy of the teeth.

The full bicuspid (Fig. 10) was carved by a laboratory man,

and is his first attempt at such work. By comparing this with the plaster models that were given him to copy, it will be seen how possible it is to reproduce their anatomical shape.

One of the great difficulties experienced by the orthodontist is to retain the mesio-distal relation after it has been established. Very frequently this trouble is due to improper fillings, or inlays, on the occluding surfaces of the teeth, particularly those of the lower first molars. If these restorations can be made so as to accurately reproduce the original shapes of these teeth, and thus permit the large mesio-lingual cusp of the upper first molar to properly seat itself each time the teeth are closed, do you not see what a powerful influence is exerted by the action of the incline planes of this cusp on the incline planes of the five cusps of the lower first molar to prevent a return to a mesial or distal malocclusion, and do you not see that to a proportionate degree each reproduction of the normal occlusal surface of a tooth exerts a like helpful influence? Where all restorations accurately reproduce the original anatomical landmarks, the orthodontist will experience much less difficulty in the retention of these cases.

Granting, then, that these occlusal restorations are possible, does it not appeal to you that they are necessary from the standpoint of beauty, perfection of anatomical contour, and especially of efficiency?

In presenting to you the keen appreciation by the orthodontist of the importance of normal occlusion, it is with the hope of arousing a like appreciation in the dentist, so that in all his efforts at restoration of the lost parts of the dental apparatus he will be inspired to accurately reproduce, in the minutest detail, their anatomical shape. If I have succeeded in doing this I shall feel well repaid and will look forward with keen interest to a heartier co-operation between the dentist and the orthodontist in the attainment of normal occlusion.

A PLEA FOR DEEPER INVESTIGATION OF DENTAL DISEASES¹

BY WILLIAM J. GIES, PH.D.

Learning advances most rapidly along the broad highway of investigation. It is true that we acquire essential knowledge of many things by accident, that we stumble here and there upon important discoveries, but most of our information is obtained through conscious and well-planned effort to increase it—*i.e.*, through the agency of research.

“Science advances because it is never sure of anything.” So said Duclaux! Such a candid assertion is neither an expression of hopelessness nor an indication of inefficiency—it merely reveals the conviction, as voiced by Paulsen, that *the way to truth leads through error*. “All progress consists in showing that the *past truths were errors, or at best half-truths*. That does not make them superfluous; they constitute the stages by which the human mind ascends its precipitous path.”

Our knowledge of disease is no exception to the rule that “*science is certain of nothing*.” Weak and unsteady as it is, our system of facts regarding disease has grown up through the ignorance of superstition, and has developed on the half-truths of empiricism. It is now in progressive evolution toward a more comprehensive basis of truth, through the use of newly invented experimental methods and by the employment of old methods that have been improved or perfected.

No known disease is fully understood. Dental caries is one of the diseases about which we know very little. Our knowledge of the etiology of dental caries, except of that following gross injury, is characterized by its uncertainty and its paucity. Is dental caries due to a deterioration in the quality of the interior of the tooth or of the enamel on it? Is the disease independent of internal conditions and the state of the enamel—may it result wholly from the influence of factors external to the tooth? Is the disease caused solely by harmful substances in, or conditions of, the oral

¹ Address before the Section on Research and Stomatology, 1st Dist. Dental Society, February 10th, 1912. See discussion, page 272.

secretions? Does it result from the destructive action of oral micro-organisms to the exclusion of other special factors? Is it always inaugurated by food remnants held against the tooth? Do systemic conditions of any kind favor the onset of the disease by modifying either the external oral environment or the internal conditions of the tooth? Are we sure of the answer to any of these questions? All of them and many others occur to every student of dental disorders. Such questions quicken interest in dental caries and impel investigation of this most prevalent of all diseases.

A prerequisite to deliberate research in any relation is a clear conception of the problem or the need. In his everyday work the dentist, like the surgeon, has been chiefly occupied with the perfection of repairs. This has been a splendid service. But the dental profession, like the general medical profession, has appreciated the need for successful methods of *preventing* diseases. In fact, the *prevention* of dental disease is the highest ideal of the dental profession, and has become its greatest problem for research.

The Institute, in representing this prevailing position of the dental profession, turned its attention to that particular part of the great problem which relates to the etiology of dental caries. At the outset you did me the honor to invite my co-operation in this work, and you gave me the opportunity to formulate the plans of procedure in any direction that might seem best. This responsibility was accepted hopefully, but with keen appreciation of the great obstacles to be overcome. I have enjoyed the active co-operation of Dr. Alfred P. Lothrop from the start. Together we have been going forward as rapidly as careful inquiry along the way has permitted.

When I look back and reflect on the little we have accomplished I recall the similar negative experiences of many other hopeful investigators under even more promising conditions. Although disappointed, I am in no sense discouraged, although I could not blame you if you accepted the situation with impatience.

Research aims at the ultimate discovery of unknown relationships, not merely at the acquisition of isolated facts. The investigator is often like the sailor who puts to sea at night, with neither a light to guide nor a compass to direct him. The inves-

tigator must be prepared for rough seas and arctic weather on every passage. He must expect to engage in many profitless voyages. He must react to disappointment with optimistic rededication to the work in hand. He must know neither discouragement, dismay, nor defeat. His greatest joy must come from the *going*, whether discovery rewards his journeyings or not.

Most instructive for you and for me in our attitude to research is the career of Pasteur. How great were his achievements! How little his earlier efforts promised! How stimulating and comforting is his example when difficulties in research loom large and foreboding; when earnest efforts seem barren of significant results; when courage weakens, high purpose falters and devotion is taxed to the utmost; when the demand for *immediately* "practical" results is insistent and uncritical.

Let me indicate briefly, with liberal quotations from a recent paper, for our renewed inspiration to-night, some of the most significant stages and events in the evolution of the greatest scientific career and the most beneficent biological work of the nineteenth century.¹

"At fourteen, Pasteur was sent to the College of Besançon. He remained there but a half year. Translated suddenly to a wholly strange environment, the shy country boy suffered so much from homesickness that he made little progress in his studies, and his health became so affected that his life was actually endangered. His father was compelled to bring him home. . . . The next year he requested his father to enter him at the home college of Arbois, a rural *lycée*, little better than a grammar school.

"Here he studied diligently, but received no instruction in the subjects which appealed to his nature. The old master assigned to teach the sciences frankly acknowledged that he knew nothing about them. But he allowed the young student access to the limited equipment, and young Pasteur spent much time in laboriously teaching himself some of the elementary principles of physics and chemistry. *His teachers considered him slow. Drawing was the only subject in which he attained 'honorable mention.'*

"At graduation he was offered the position of *preparation*

¹ Martin: Pasteur, a Study in Greatness. Popular Science Monthly, 1911, lxxix, p. 5.

assistant or coaching tutor to the younger pupils, a post which carried the munificent salary of 300 francs per annum, with board and lodging. He accepted the position gladly; and, with charming modesty, expressed the conviction that the salary was much beyond his deserts.

"Small as his salary was, still he managed to save out of it something to help educate his sisters. Meanwhile, he worked hard on the studies required for his B.S. degree, a prerequisite to his entering the Ecole Normale Supérieure at Paris. *On this examination he was graded 'mediocre' in chemistry.*

"About this time he was shown a sample of a strange new acid of the same composition as tartaric acid, but manifesting strikingly different physical characteristics. His curiosity was intensely aroused.

"Tartaric acid had been discovered in the 'tartar' of wine casks by Scheele, of Sweden, in 1770. Thann, an Alsatian manufacturer of tartaric acid, discovered some of the anomalous variety in the output of his factory in 1825. He was unable to reproduce it. It was studied by Gay Lussac and Berzelius in 1826. The latter proposed for it the name of paratartaric acid; the former suggested that it be called racemic acid. Mitscherlich, of Berlin, in 1844, reported it as isomorphous with tartaric acid; and discovered that while the latter rotates a beam of polarized light to the right, racemic acid is inactive in this respect.

"These were the facts brought to Pasteur's attention at the time when he was shown a specimen of the acid. Although immensely interested in the mystery presented by racemic acid, he put it aside, resolving to take it up when through with the final examination of his course of study, an ordeal for which he was just then preparing.

"His usual examination fortune attended him upon this occasion. His classmates, who were wise in their generation, merely cramming for the test, came through with flying colors, while *his name appeared near the bottom of the list.*

"He was appointed laboratory assistant to Laurent, the first to formulate an hypothesis of the substitution of hydrogen in hydrocarbons. This theory was elaborated and enunciated in its final form by Dumas in 1834. At this time Laurent was working on sodium tungstate. One day he showed his assistant, under the

microscope, some crystals of this salt, supposedly pure, but which manifested three distinct forms of crystallization. Pasteur began at once to learn how to use the goniometer. In order to master its technique he made elaborate measurements on *all easily crystallizable tartrates*, thus revealing the fact that *his curiosity concerning the two known tartaric acids had remained lively throughout the preceding two years.*

“ In the meantime he was working toward the doctorate, which he achieved August 23, 1847, *on the strength of two small papers*, the one entitled ‘Researches on the Saturation Capacities of Arsenious Acid: A Study of the Arsenites of Soda, Potassa and Ammonia,’ and the other ‘A Study of the Phenomena Relative to the Polarization of Liquids.’

“ He himself said of these papers: ‘*They are elementary, and little more than programmes for future work.*’ Again he attained *but poor ranking.*

“ He now desired to study in Germany, but poverty frustrated his plans. On March 20, 1848, he read before the Académie des Sciences a part of a paper on dimorphism *which was little more than a catalogue of all known substances crystallizing in two forms. Of itself, one might say that it was almost valueless.* But to the student of Pasteur’s life it was a *proof that his work on the tartrates was still being prosecuted, and it afforded an index pointing out the tenacious purpose and the resolute will of the man.*

“ After a flash of republican ardor in 1848, in which he not only volunteered service but also contributed to the cause all his savings, 150 francs, *he returned to his crystals, and soon had the fortune to discover hemihedrism in the tartrates*, a fact that had escaped the scrutiny of Mitscherlich and of Provostaye.

“ So far as his investigations showed, all crystals of tartaric acid had hemihedral faces, but he had found none on the racemates. *Conceiving that this aspect of crystals might be an index of their molecular structure, he reasoned that the diverse optical behaviors of solutions of tartaric and racemic acids might be explained by a structural law.* On fire with this new idea, he carefully examined a lot of tartrate crystals, and found, as he had anticipated, that each had hemihedral facets. He turned now to racemate crystals, expecting to find them destitute of hemihedrism. *Imagine his disappointment, therefore, upon finding that here also*

each crystal distinctly displayed hemihedrism. *But upon laboriously going over his work again he discovered a fact that had previously escaped his notice*—namely, that the half-form facets of tartaric acid were all turned toward the right, while those of the racemates were half right-handed and half left-handed. *A new idea flashed into his mind.* Carefully picking apart the two kinds of racemate crystals he made a solution of each and, with anxious mind and throbbing heart, applied the polariscope. The solution of right-handed crystals deflected the beam to the right. There were pure tartaric acid. The solution of left-handed crystals deflected the beam to the left. They were *a new acid—levo tartaric acid.* He mixed his solutions in equal proportions. The mixture did not affect the beam. *It was racemic acid.*

“His excitement was so great that he could not look through the instrument again. Like Archimedes, he exclaimed ‘I have found it,’ and rushed into the corridor, where he met an assistant whom he embraced in a transport of joy.

“This was one of the most illuminating discoveries known to the history of chemistry up to that time. Measured by its ultimate results, it is doubtless the most far-reaching discovery ever made. Developing in one direction, it was the *germ of a new science—stereo-chemistry*; in another, it *transformed medicine and agriculture* from empirical practises into true sciences; and incidentally it enriched the world by a number of *other discoveries of unparalleled practical value.*

“*Realizing fully the value of the vein he had discovered in tartaric acids, he directed his energies along that line.* He had found out what para-tartaric, or racemic, acid is; but neither he nor anyone else knew its origin. He now undertook the discovery of this. In 1852 he visited all the factories of tartaric acid in Germany and Austria, endeavoring to trace the production of racemic acid to its source. He ascertained that the manufacturers generally had an idea that racemic acid was either potassium or magnesium sulphate, and consequently rejected it in the process of refining tartaric acid. This accounted for the limited quantity which had accidentally found its way to the market. As most of the tartars came from the south of Europe, and had been subjected to a preliminary rectification before shipment, it was further evident that but a moiety of racemic acid ever reached the

factories. He pushed on his inquiries, visiting factories and vineyards, until he positively located it in the crude tartar, where he found, as he had anticipated, that it was *produced abundantly simultaneously with tartaric acid in the fermentation of wines*. He wrote of this quest, 'Never was treasure sought, never adored beauty pursued, with greater ardor.'

"*Having located the natural source of racemic acid, Pasteur next undertook to synthesize it from tartaric acid*. This appears an easy problem in the light of what every student now knows of the methods for effecting hydration, for constitutionally racemic acid differs from tartaric merely in possessing water of crystallization. In June, 1853, he was able to announce the completion of this great work, which had been accomplished by maintaining cinchona tartrate at a high temperature for several hours. This synthetic product was also optically inactive. It is known as meso-tartaric acid, and is the fourth form of the series. This research brought its author the grand prize of the Académie Française and the ribbon of the Legion of Honor from the government.

"*Looking now at the tartaric acids, Pasteur's mind took a wider sweep. He saw that they were typical of all living things, which present asymmetry everywhere, and that they themselves were products of a form of life*.

"While engaged upon the racemates he had found that the dextro-crystals alone were altered by fermentation, the lævo-forms remaining unchanged in the liquor. 'The reason for this,' said he, 'can only be because this special ferment *feeds*, so to speak, more easily on the dextro-forms.'

"*He pondered this problem long before he saw his way clear to its solution*. At the same time he sought to unravel the indicated physiological significance of chemical affinities.

"In 1836, Cagniard de Latour had remarked that yeast, the ferment of beer, was composed of cells which were capable of reproduction by a sort of budding. He expressed the opinion that this microscopic plant probably acted on sugar by some sort of vegetative effect. A similar observation was made about the same time by Schwann, of Germany.

"*Pasteur set himself the problem of solving the mystery of fermentation. His notes show that he commenced by projecting an hypothesis associating fermentation with the dimorphism he*

had discovered in tartaric acid, which must have been caused in some way, he thought, by the action of a ferment on the grape juice.

“ Berzelius, whose ideas then reigned supreme in chemistry, was of the opinion that fermentation is a *catalytic* process. He gave it as his opinion that what De Latour *believed* that he had seen was organic matter precipitated by the process of fermentation, presenting forms *analogous* to vegetable life. Liebig's explanation was equally mystic. He defined fermentation as ‘action due to influence.’ He held the opinion that a ferment is a mass of organized matter set free from yeast cells by their death and consequent rupture. Such matter he supposed to consist of unstable molecules, which in the act of changing into new molecular arrangements liberated energy which in turn converted molecules of sugar into molecules of alcohol.

“ *Uninfluenced by the metaphysical speculations of these great scientists, Pasteur held to the sure road of experimentation.* In August, 1857, he discovered the fermentative organism which sours milk and produces lactic acid. The same year he was transferred to the Ecole Normale Supérieure at Paris. The next year he discovered that glycerine and succinic acid are both produced simultaneously with ethyl alcohol when sugar is fermented.

“ That Pasteur lost no implication of any phase of his researches is shown by a letter to his friend, Chappuis, written in January, 1860. He says: ‘I am hoping to mark a decisive step very soon in the celebrated question of the spontaneous generation of life. Already I could speak, but I shall require the accuracy of an arithmetical problem. I intend to attain even that.’ In a letter to his father, of about the same date, he says: ‘These results open new visits to physiology. God grant that by my persevering labors I may bring a little stone to the frail and ill-assured edifice of our knowledge of those deep mysteries, life and death, where all our intellects have so lamentably failed.’

“ The lapse of a year after the letter cited above enabled Pasteur to announce: ‘Of gases, fluids, electricity, magnetism, ozone, things known or things occult—there is nothing, in the air, conditional to life *except the germs it carries.*’

“ *This dictum was at once fiercely attacked by the generationists who included in their party savants of European fame, the*

most notable being Bastian, of London. The discussion held the almost breathless attention of the newspaper-reading world, and ended some years later in Pasteur's triumphant demonstration of his thesis.

" You can readily imagine that this research was not prosecuted by Pasteur because of its mere academic interest. He appended to his first paper, quoted above, this query: ' What could be more desirable than to push these studies far enough to prepare the road for a series of researches into the origin of various diseases? '

" By the close of 1871 he had shown that the ' diseases ' of wines and beers were caused by certain bacteria, all of which might be killed without injury to the product by heating it for a few minutes at a temperature of 50°-60° C.; and that if hermetically sealed at this temperature the liquors might be preserved perfectly for an indefinite period.

" These studies had now thoroughly convinced their author that all diseases are of bacterial origin—a conception, you will recall, which had first come into his mind by a flash of genius ten years before. Indeed, four years prior to this (1867), Pasteur's researches had convinced a British surgeon, Joseph Lister, of Edinburgh, of the microbic origin of those purulent infections which accompany wounds and surgical operations. And although himself unacquainted with bacteriology, he successfully devised the method of antisepsis which has made his name a household word.

" Before the close of 1873, Pasteur finished the solution of that great problem begun at Lille nineteen years before—the mystery of fermentation. It is this: Certain bacteria, living at the surface of sugary fluids, cause no fermentation, because they secure the oxygen which they need from the air. They are ærobic. But if sunk, by accident or otherwise, beneath the surface they must either perish or adapt themselves to their new environment by extracting oxygen from the nearest source of supply. This is the sugar of the solution. They are able to accomplish this but slowly at first, and the bulk of the first submerged bacteria suffocate. But reproducing rapidly by budding, ensuing generations are gradually but, for us, rapidly converted into true anærobes, which,

robbing the sugar molecules of oxygen, cause that chemical change called fermentation.

"This problem solved, Pasteur was able to show from it the following results of his work: (1) Precisely what fermentation is; (2) that ferments are living organisms; (3) that every variety of fermentation is caused by a special ferment; (4) that neither bacteria nor any other life forms are spontaneously generated; (5) how to prepare culture media suitable to the growth of various bacteria; (6) how to propagate pure cultures of bacteria; (7) a basis of classification of bacteria; (8) the chemical and microscopical technique of bacteriology; (9) the cause and cure of various silkworm 'diseases' of fermented liquors; (10) the cause and cure of various silkworm diseases; (11) an explanation of the mystery of the optical behavior of tartaric and racemic acids; (12) two new tartaric acids; (13) how to synthesize meso-tartaric and racemic acids; (14) how to make racemic acid available to commerce.

"In comparison with this great work of Pasteur's, the classic example of persevering genius—Newton's fourteen-year pondering over falling bodies—sinks into insignificance, no matter how considered, either as to time involved, the difficulties encountered, or the practical value of results obtained. Nor must one fail to note that incidentally Pasteur had beaten out a road into a new world and created two new sciences which were to serve as vehicles for its exploration and exploitation.

"A paper to the Académie des Sciences, presented December 30, 1878, closes with these words: 'Is it not permissible to believe that a day will come when easily applied preventative means will arrest those scourges which suddenly desolate and terrify populations.'

"In 1879 he isolated the microbe of feruncles, and in 1880 those responsible for anthrax and chicken cholera.

"Prophylactic vaccination had, of course, been known in an empirical way prior to this in connection with smallpox. But these researches of Pasteur's afford the first explanation of that procedure, and in addition, cast a flood of light upon the etiology of disease. They firmly established the germ theory, ushered in a scientific practise of medicine and sent to limbo a thousand pious superstitions about demoniacal possessions and the mysterious

visitations of an all-wise Providence that doeth all things well. For these researches, the imperial government conferred upon him the cross and cordon of the Legion of Honor.

"The conquest of rabies was the last great work accomplished personally by Pasteur. Re-attacked by paralysis in 1888, he could thenceforth prosecute his ideas only by the labor of other hands. But he had a host of disciples in Europe and America, some of whom had studied under his personal guidance, but many more who, without having seen the great master, had nevertheless lighted their torches at his flame. I know of no surer index of a man's greatness than the measure of inspiration imparted by him.

"Pasteur's discoveries were epoch-making, and revealed in him the Copernicus of medicine. Prior to his researches, the causes and rational treatment of disease were no better understood than in the stone age. Naturally, his conclusions were not accepted by medical men till every possible opposition had been exhausted. Physicians resented instruction from a man devoid of medical training. 'A mere chemist' was the sneer most frequently on the lips of his adversaries. When they could no longer deny the existence of microbes, adherents to the old school still vehemently asserted that they were merely an epiphenomenon."

Pasteur's brilliant career as an investigator was inaugurated with the study of the crystallin qualities of tartrates. At its beginning this work seemed to lead nowhere, and probably was frankly considered "puttering" by his more "practical" colleagues. Yet Pasteur early divined the wonderful import of his work. He proceeded earnestly along the way that each new discovery laid open before him. How many among the practical men of Pasteur's day would have been willing to "waste time" on "crystal gazing" as he did? Who of Pasteur's colleagues would have sought the prevention of disease by the roundabout though deliberate route followed by Pasteur? Who among the "authorities" of the day would have asserted with confidence that antiseptic surgery might result from the discovery of the cause of fermentation? How many leaders in medicine would have refrained from smiling at the suggestion that Pasteur's work on the tartaric acids would provide the key to the lock on the door

of the room in which the great mysteries of infectious diseases had been hidden through the ages?

Science advances because it is never certain of anything! Will it not continue to advance in our day as it did in Pasteur's: along the lines that authority may disregard, into channels that few may think of traversing—away from the self-evident into the heart of the improbable?

If dental caries baffles all investigation to-day, let us look forward to to-morrow. Let us welcome every new flash of light on it, every new assumption regarding it, every new effort devoted to it, every new worker prospecting through it. The most "unreasonable" plan of research may be the most fruitful, the "most probable" explanation may be the most ridiculous. I plead for open-minded interest, for the most unselfish purpose, for the most general attention, and for the most lively activity in every possible relation to dental research as to every other.

In the spring of 1909 your honored president, Dr. Howe, invited my attention to the problem of dental caries. At that time I knew nothing about dental caries, except what I had learned from personal experience as a sufferer from the disease. During the succeeding summer I occasionally glanced through some of the literature on the subject. I saw confusion and uncertainty on every page I examined. I then realized how much had been ascertained and yet how little had been learned. In the fall I conferred with your research committee, at its invitation. During the informal discussion that ensued, I indicated my keen interest in the problem of dental caries. I also stated my willingness to direct an investigation of that problem under your auspices.

At our conference (October, 1909) I suggested the possibility that dental caries might be inaugurated by the entanglement of bacteria in mucin masses adherent to and held between teeth, where micro-organisms would thrive at the expense of available carbohydrate, and the resultant "fermentation acid" would dissolve the enamel locally prior to penetration into the dentine. This idea regarding the rôle of salivary mucin was suggested by fifteen years of laboratory experience with glycoproteins of various kinds. When I expressed this opinion I fancied it was a new view of the matter—at that time I had assimilated very little of the literature of the subject! I was deeply gratified to find a few

months later, during the progress of the ensuing investigation, that your distinguished colleague, Dr. E. C. Kirk, of Philadelphia, had formulated this theory in some detail.

Although my past experiences with mucin and its glycoprotein relatives tempted me to propose a research aimed directly at my supposedly new theory regarding mucin as an etiological factor in dental caries, I felt that it would be best to ignore all opinions in the literature, as well as my own preferences, and to "begin at the beginning" with a quantitative study of the possible relationships between salivary composition and the condition of the teeth. It seemed most logical to assume at the start an etiology (1) dependent primarily on extradental conditions and (2) discernible from variations in the most voluminous (though the most changeable) of the materials in the oral environment—the saliva. *Does the saliva vary in composition definitely and symptomatically with variations in the conditions of the teeth?* This was the question that I raised for our guidance in the first of our inquiries into the subject.

Two years ago we presented a detailed report of our earlier findings.¹ *Our results answered the leading question in the negative.* We said (page 283): "Our data fail to show any definite relation between the general composition and qualities of a given fraction of saliva and the condition of the teeth of the individual secreting it. This fact has made it seem inexpedient to conduct a more detailed inquiry at present into purely salivary features of leading types of dental disease processes. That the *systemic condition* of the individual is an important factor in susceptibility to dental caries is a conviction that we cannot dismiss. Nevertheless, direct external attack upon teeth by micro-organisms appears to be the most important single factor in the carious processes. Mucinous plaques afford favorable conditions for such external attacks."

In our discussion (in that first report) of the possible relation of mucin to dental caries we wrote as follows (page 281): "During the past twelve years we have conducted numerous researches in our laboratory on the mucoids and mucins. These substances, when treated with alkali and other basic materials, form viscid, sticky solutions which, if very concentrated, are like

¹ Lothrop and Gies: This Journal, 1910, v., pp. 262-290.

semi-solid mucus. When saliva is concentrated by evaporation it acquires such a consistence. It is easy to understand that, under ordinary oral conditions, salivary mucin tends to form viscid films and layers on the teeth. Such sticky coatings entangle and hold bacteria by the millions, and also provide nutrient media for the growth and multiplication of micro-organisms. Unless they are mechanically removed, mucin layers tend to thicken by accretion and to harbor an increasing number of bacteria and fungi. Water and other necessary nutrients are supplied to the micro-organisms in such mucin plaques by diffusion from saliva and from liquid food, as well as from disintegrating food particles that are held on and between the teeth. Special nutrient efficiency of the saliva, as determined by its various constituents, qualitatively and quantitatively, may be an important predisposing factor in dental caries by favoring the prolific growth and particular sustenance of micro-organisms throughout the oral cavity. In like manner, the bacterial products diffuse in one direction into the free saliva and liquid food masses, and also pass in the opposite direction against and along the tooth surfaces. During sleep, when the oral and dental surfaces are relatively unaffected by mechanical influences, and when saliva flows sluggishly, if at all, bacteria and fungi multiply at particularly rapid rates and make their products in comparatively large and accumulated proportions. These views harmonize with our observations on the relatively high acidities of fractions of saliva which were obtained from subjects immediately after their awakening from a night's sleep. As we have already stated, we believe that this increased acidity was due to microbic production, and not to acid elimination from the salivary or buccal glands. We think the increased acidity is detectable, in such cases, because it represents an *accumulation* in a *stagnant* liquid—something that cannot readily occur in a cavity bathed by a fluid which is frequently removed from that cavity, as is the case with saliva in the mouth at practically all times except during periods of sleep. May not analysis of fractions of saliva be unproductive of results that explain carious processes for the same reason that the analysis of water from the mouth of a river might fail to show the cause of certain very obvious, though gradual, corrosive effects at particular places on its banks? Liquid agents of such local disintegrations might be generated continuously in small quan-

tities at various points on the banks and, running over the banks into the river, might be not only changed in part by reactions with substances in the banks, but also attenuated by the river volume into proportions too minute for chemical detection in any ordinary specimen of the water taken at random. In such cases we should wish to examine the water at or very near the point where the disintegration material entered the river, in order to secure more favorable conditions for the detection of the corrosive factors. Or, better still, *we would make a chemical examination of the disintegration processes and products at their sites on the river banks themselves.*"

My prior experiences with mucins and mucoids led me to suggest also (page 283) "that diluted vinegar or common fruit juices—*acid media ordinarily present in food*—may be very helpful agents in the removal of mucinous masses from teeth, especially if applied directly with a suitable instrument. It is probable that the cleansing effect of such treatment would be less harmful to the teeth than the frictional operations now in use for similar purposes. That this suggestion is not as radical as it may appear to be is obvious from the fact that the effects of occasional *well directed* treatments of the teeth with *food acids* could not be more deleterious than the influence of the same materials in the mouth, and on the teeth, when ingested with food." The well-known stimulating effect of acids upon salivary secretion is an added factor of importance in this connection, for residual *free* acid (after such treatment) would speedily be neutralized by the basic elements in the resultant, augmented, volume of saliva.

Finding that the quantitative composition of the saliva, so far as we studied it, failed to offer a clue to the nature of dental caries, we assumed that other features of the oral environment were responsible for the disease. Accordingly, we turned to an investigation of the *bacterio-chemistry of dental caries*. This research involves an extensive study of the nature, growth, activities, and destruction of oral bacteria; of the chemical properties and physical qualities of mucin; of the solvent powers of the products resulting from the bacterial transformation of food substances, and similar matters. Last May we stated some of the results of the preliminary experiments in these connections.¹ The studies

¹ Baker and Gies: This Journal, 1911, vi, pp. 289-296; also Lothrop: *Ibid.*, pp. 297-322; Smith and Baker: *Ibid.*, pp. 323-333; Gies: *Ibid.*, pp. 334-338.

are now in progress, and although they cannot be completed within the year, we hope to report details of the work at an early date, especially in relation to mucin and mucin salts.

The more I reflect on the available facts regarding dental caries the more I believe in the *possible influence of systemic conditions* as factors in its onset and in its progress. I said this in our report two years ago. Let me read a significant editorial in this connection from a recent issue of our leading medical weekly.¹

"It may be regarded as established beyond reasonable doubt that a relationship exists between tetany and removal of the parathyroid glands. MacCallum and Voegtlin² have suggested that this relationship may be due to the influence of the parathyroids on calcium metabolism. For they found that removal of the parathyroids was followed by increased calcium excretion with diminution of the calcium content of blood and brain, and that the tetany following extirpation of the glands could be avoided by the injection of calcium salts. This relationship between the parathyroids and calcium metabolism has recently been given striking confirmation by Erdheim³ and several co-workers, who have studied the effects of parathyroidectomy in white rats. In rodents the incisor teeth present the peculiarity of constant growth, resembling skeletal bone in this respect, so that they afford remarkable opportunities for the study of the details of calcium deposition. During a series of experiments on the relationship between parathyroid extirpation and tetany, Erdheim noticed that the incisor teeth of the rats became liable to repeated fracture, and a careful study of this phenomenon has led to several interesting observations. In the normal incisor tooth of the rat, the dentin forms the principal portion; a conical pulp cavity pierces this longitudinally, and a narrow zone of dentin adjoining this cavity is normally undergoing calcification, while the greater part has already received its complete deposit of calcium. On removal of the parathyroids, it was found that calcification of the dentin at once ceased more or less completely; the portion already hardened underwent no change, but as the effects of use wore down this

¹ Editorial: The parathyroids and calcium metabolism. *Journal of the American Medical Association*, 1911, lvii, p. 1370.

² MacCallum and Voegtlin: *Jour. Exper. Med.*, 1909, xi, p. 118.

³ Erdheim: *Frankfurt Ztsch. f. Path.*, 1911, vii, p. 178.

older part, the new uncalcified dentin taking its place lacked strength, and fractures followed. Imperfections in the enamel deposit also occurred, though at a later period than the alterations in the dentin. By regulating the time between extirpation of the glands and examination of the tooth, all transitional stages between the normal tooth and one almost completely decalcified could be obtained.

“Still more interesting results followed the transplantation of the parathyroids. Owing to the great difficulty of getting successful growth of the transplanted organs in a second animal, the earlier work was limited to the transference of the glands from the neck to the abdominal wall. This was successfully accomplished in nine cases, and in each of these there was found in the incisor teeth a zone of uncalcified dentin, corresponding to the period of parathyroid quiescence, interposed between two layers of normal dentin. Transplantation of the gland from one animal to another in which the parathyroids had been previously extirpated was successful in only one instance. In this animal, some time before the examination of the teeth, the transplanted glands were also removed. Corresponding to the period of removal of the animal's own organs, there occurred a zone of uncalcified dentin. Another partially calcified zone indicated the period of activity of the transplanted glands, and a third zone, completely lacking in calcium salts, recorded that of the second removal.

“In the face of such evidence there can be little doubt of the influence of the parathyroids on calcium metabolism. Additional proof has been afforded in the case of skeletal bones by Erdheim and by Canal, who have both shown that, under the influence of removal of the parathyroids, callus formation is greatly retarded, owing almost entirely to deficient calcium deposition.

“Erdheim does not hesitate to call attention to the similarity between his findings and those in rickets and osteomalacia. As additional links between the two processes he cites the relative frequency of hypertrophy of the parathyroids in osteomalacia, and the almost exact similarity in the changes of rachitic teeth and those of his animals. Although a connection between tetany and rickets has long been noted, it would as yet be premature to ascribe all cases of both unreservedly to lesions of the parathy-

roids. It has been found by Badt and Klose¹ that changes analogous to those of rickets and osteomalacia occur in young dogs after removal of the thymus, so that at present the pathologic basis of these diseases cannot be stated with any degree of certainty. However, it is possible that as complicated a process as the calcium metabolism of the body may be influenced by any one of several factors, and that the similar clinical findings may have various sources, as for instance is the case with experimental diabetes. Apparently, however, the problem of the etiology of rickets and osteomalacia is in a fair way toward being made clear, and its ultimate solution should merely be a matter of farther work along lines already indicated."

Similar facts in Erdheim's work have been summarized from related points of view, as follows:²

"Erdheim noted not only tetany in the rat (after parathyroidectomy), but changes in the teeth with which the rat gnaws. The enamel on the anterior surface of the teeth becomes opaque, and white spots appear in it. The teeth often break off in the alveoli. This happens first in the upper jaw, then in the lower. The microscopic changes in the teeth show changes first in the dentine, then in the enamel and its epithelium. There is a hypocalcification in the dentine. After the fracture of the teeth, the teeth in the antagonizing jaw attain great length. Erdheim has also noted changes in the lens, resulting in cataract. In four cases of puerperal eclampsia, there was hyperemia of the parathyroids, and in two, one of the parathyroids had a small circumscribed spot, an injury of the parenchyma; and in one of these two cases, a small hemorrhage into the glands.

"Erdheim believes that there is a connection between osteomalacia and parathyroid insufficiency, the direct result of the involvement of calcium metabolism. Osteomalacia puerperalis, according to Erdheim, is associated with disease of the 'epithelial bodies.' Here he found often hypertrophy of the parathyroids and consequently a hyperparathyroidism. In congenital cretins, where the thyroid is absent, the symptoms of cretinism continue, although all the parathyroids are present. The growth of the

¹ Editorial: The function of the thymus. *Journal of the American Medical Association*, 1911, lvi, p. 898.

² Ott: Internal secretions from a physiological and therapeutical standpoint, 1910, pp. 133. (E. D. Vogel, Easton, Pa.)

bones in these cases is retarded; the presence of the 'epithelial bodies' does not prevent it. They are not converted into thyroid tissue, as held by some English physiologists."

I have quoted these statements regarding the parathyroids in order to emphasize my feeling that systemic influences may be operative in the etiology of dental caries. Such statements as those I have quoted indicate strongly the need for openmindedness in our approach and the necessity for unconventional methods of attack. We must not be content to anchor in the sea of preconceived notions. The parathyroids may have no connection whatever with dental caries but the possibility that these glands, or other systemic factors, do bear etiological relationships to dental disorders, is both refreshing and stimulating. *Enamel may not be as fixed and as nutritionally unchangeable as dentists have been assuming!* Our most clarifying knowledge of dental caries may suddenly spring from very unexpected sources. Remember the story of Pasteur's discoveries!

I can assure you, with confidence, that discoveries of ways and means for the prevention of dental caries will increase rather than decrease the opportunities of your profession for usefulness and service.

I have discussed my subject, to-night, primarily from the standpoint of the idealist. Yet all of us, *practically* inclined as we are, expect "something more substantial than the stuff that dreams are made of." *We should find it easy and pleasant to work together along idealistic lines to practical ends.* We have been doing so for two years. We have been attempting to co-operate with you effectively. We desire to be of more service with each succeeding year of the research. We welcome your professional suggestions. We invite your individual co-operation. We hope we may hold your personal interest. We shall endeavor to deserve your confidence.

Let me conclude my remarks with a quotation which indicates, better than I can express them, the aspirations that animate the noblest types of research—aspirations that I am happy to share with you as we proceed: "There is no realm in which the deep satisfaction of seeing discovery applied to human service is more likely to be experienced than in the realm of medical research. Consider how great must have been the joy of Pasteur

and of Lister when they realized that the consequences of their investigations must lessen forever plague and pestilence and pain in men, and in the lower animals as well, and must permanently remove much of the blind struggle against mysterious agencies of disease and death. The letter which Walter Reed wrote to his wife on New Year's Eve, 1900, at the end of his experiments on the transmission of yellow fever, tells something of the joy of such service: 'The prayer that has been mine for twenty years,' he concludes, 'that I might be permitted in some way or at some time to do something to alleviate human suffering, has been granted! A thousand happy new years.' And a thousand happy new years there will be for thousands of men and women and children, because of that one research in Cuba."¹

¹ Cannon: Medical research; Journal of the American Medical Association, 1911, lvii, p. 1361.

SOME METHODS THAT LEAD TO FAILURE IN PORCELAIN INLAYS, AND THEIR CORRECTION¹

By W. T. REEVES, D.D.S., CHICAGO.

[Synopsis of defective methods:

Flat seats, parallel walls, and sharp angles in cavity preparation.

Lack of sufficient material in making a matrix, and lack of pressure in burnishing the same.

Wrong conception of color selection for the inlay that is to be.

Defective manipulation of porcelain bodies in trying to produce the color effect desired, and failure to properly fuse porcelain bodies so as to obtain true porcelain with the maximum of density and strength.]

I am well aware that to the great majority of those present, what I am about to present to you to-day, will seem extremely radical as to doctrine and teaching—also that there are few, if any, present, who will agree in whole or in part to the doctrine I shall present to you.

If I make one convert, I shall feel repaid for my effort; at least I hope to give you something to think about. It is almost an impossibility for a person to convey by written or spoken word, to two other minds, the same interpretation of a subject. Each will interpret according to his own experience or knowledge in that subject, and there will be as many different interpretations of what I shall say to-day as there are persons present. It is only through the eye that approximately the same impression will be received by all. I regret exceedingly that I have no models to illustrate the different principles I shall try to present to you.

In the clinic I shall perform before you, in so far as the cavity permits I shall endeavor to demonstrate, through the eye, the principles I advocate.

I apologize for writing this paper in the first person in-

¹ Read before the Massachusetts Dental Society, Boston, Mass., May, 1912.

stead of the third person. I want to get next to you, and the only way conviction is carried, and you are convinced that a person believes what he says, is by, "I this" and "I that."

You have all seen in print in our dental journals and heard on the floor of dental meetings this expression: "Porcelain inlays have their place in operative dentistry and are all right if used where indicated."

"Where indicated"—have you ever stopped to think what "where indicated" means? "Where indicated" means simply this: wherever an individual can successfully perform a given operation, to him that is where that operation is indicated. To illustrate: Dr. A can and does successfully fill, let us say, three classes of cavities with porcelain. Beyond those he fails for one cause or another; to him those three classes of cavities are where porcelain is indicated. Dr. B has worked a little harder and studied a little closer, and he is successful with porcelain in five classes of cavities. To B that is where porcelain is indicated, etc., etc., and I am not afraid to repeat what I said in the first paper I read on porcelain: that porcelain is only limited by the limitations of the operator.

There has been a wrong conception of what is required in cavity preparation for inlay work. Dentists from time immemorial have been taught and grounded in a mechanical form of cavity preparation, that is, a retention form of cavity and an interlocking form of filling, whereas for inlay work it is not the law of mechanics that governs cavity preparation, but the law of physics.

The law of mechanics cannot enter into play where a filling is cemented into a cavity, because the cement joint will break at all parts at one instant, and your mechanical retention cannot enter into effect until the joint is broken. A cemented joint will not break at one part and allow the mechanical retention to hold and keep the balance from breaking. (It all breaks at one instant.)

Again, the great majority of dentists in preparing cavities for inlay fillings, even if they do not have a mechanical form of cavity, prepare their cavities with parallel walls, flat seats and margins square with the enamel rods. Parallel walls mean that the inlay, in porcelain work, will be as much smaller than

the cavity as the thickness of the material of which the matrix is made—diverging from parallel walls will eliminate the thickness of the material and the inlay will drop into the cavity on the wedge principle.

Parallel walls, flat seats and square margins mean butt-ended joints at all parts of the cavity, and with butt-ended joints you cannot force out the cement and the inlay home to place, but that you will have thickness of cement two or three times greater than you would have if the cavity was so prepared that the inlay entered at all points of the cavity on the wedge principle. The minimum of cement that completes the joint between inlay and cavity means the maximum of strength against dislodgment.

If you were laying the boards of this floor and the ends of the boards were cut square, that would be butt-ended joints, and with the force you can exert personally (and that is the only force you can use in setting an inlay) you would only be able to close the joint so close, but if you beveled the end of one board in one direction and the other opposite you could place one upon the other and close the joint with at least 50 per cent. of crevice that you would have if you butted the two ends together.

Cavities for inlay fillings should be prepared so that the margins are beveled to a knife-edge with the outer surfaces of the tooth, and thus eliminate the square butt-ended joints at the margins. Walls should slightly diverge from the parallel so as to insure the inlay entering on the wedge principle, and thus be able to force out the cement in setting the inlay, and secure the minimum of cement joint, which means strength of retention.

There should be a definite form for seating the inlay, so that when the inlay is forced home it can only go to one place, and the harder it is forced home the surer it is of going to the place it was fitted for. An inlay that can slide around in a cavity means that it would be almost impossible to cement it to the place it was adapted to. *Adaptation and the minimum of cement joint means strength of retention.*

To come back to the proposition that it is the law of physics and not the law of mechanics that governs the reten-

tion of inlays. I will try and demonstrate by taking two coins, a quarter and a five-cent piece. There is, we will say, about 15 per cent. difference in area of surface. To one side of the coins we will solder an attachment that will permit of a pull pressure being exerted equally on both coins. We will then glue both coins to a smooth surface.

Now I think you will all agree that the larger coin, having a greater area of surface, will withstand more pounds pressure of pull before it breaks loose. I think you will all agree that the thicker amount of glue in the stamped portion of the coins adds little or no strength of attachment. To illustrate this point further, we will take two boards, say a foot square; plane the surfaces to perfect adaptation to each other; now, taking a half-inch gauge, we will gauge six grooves across the surface of one of the boards, and gluing the boards together, we will have six grooves filled with a bulk of glue. I don't believe there is any one present who would claim that this bulk of glue in the six grooves adds any strength of attachment; on the other hand, I think you will all agree with me that we have lost just that per cent. of strength of attachment as we have lost area of surface of adaptation in the cutting of the six grooves.

To return to the coins, we will now smooth off the surface of the smaller coin, so that the whole area of surface is in adaptation to the surface we glue it to. Now the smaller coin with its whole surface in adaptation will withstand more pounds pressure before it breaks loose than the larger coin with the thicker bulk of glue in the stamped portion.

It is this principle that we want to apply to our cavity preparation for inlays: that we have the largest area of surface, to which we can successfully burnish a matrix and have absolute adaptation of inlay to all parts of the cavity. If theory does not convince you, I believe if you will give it a try out that practical results will demonstrate that you will have a greater per cent. of success with a simpler form of cavity in which you can secure absolute adaptation, as illustrated by the smoothed-off five-cent piece, than you will have with a more complicated cavity formation (the so-called mechanical retention, that prevents lateral dislodgment before

cementation) and consequential imperfect adaptation, as with the stamped quarter.

Science has to change and adapt itself to new conditions from day to day, and what we accepted as a scientific truth yesterday is discarded to-day through results that are brought out by practical demonstration.

Before leaving cavity preparation I want to speak of one thing that I believe is a mistake—the grooving of cavity and inlay before cementation. A great many dentists after they have made an inlay groove the cavity and inlay, believing they add strength of attachment, if the dentist was fortunate enough to make those grooves come opposite each other. If you stop to think a moment, I believe you will say it would be a large groove that would hold a silk ligature—and what strength would there be in a bulk of cement the size of a silk ligature, and that is all you would have, the tensile strength of cement the size of a silk ligature. On the other hand, you have lost strength of attachment, as illustrated by the gouged-out grooves in the board filled with glue.

In the making of a matrix there are two shortcomings that are prominent with a great many operators, either one of which means failure in the majority of cases: lack of sufficient material of which the matrix is made, and lack of sufficient pressure in burnishing the same.

To try and give you a general rule for the amount of platinum to use in any cavity, I would say, cut a piece of platinum large enough so that after you have depressed the platinum into the cavity you have material extending in all directions on the tooth as great as the largest diameter of the orifice of the cavity. That is to say, if the greatest diameter of the orifice of the cavity is a quarter of an inch, have a quarter of an inch of material in all directions beyond the margins of the cavity, except the cervical margin, and have as much material there as you can have without impinging on the gum tissues too much, and hurting the patient in burnishing. Many dentists, I have observed, start with a piece of platinum barely large enough to extend beyond the margins after it has been depressed into the cavity. Others who may have started with a piece of platinum large enough, after they have depressed

the platinum into the cavity and outlined the margins, trim away the excess until they have but a millimeter extending beyond the margins.

The only reason I can see as to why so many dentists have fallen into this error (and I will demonstrate that it is an error) is that sufficient operating space has not been secured by previous separation to be able to remove a properly made matrix.

Porcelain in fusing shrinks about 25 per cent. Shrinkage is in the direction of least resistance. A matrix that is trimmed down close to the margins has no strength or rigidity and cannot withstand the contraction of the porcelain in fusing. The result is failure of fit in one or more places. With material extending beyond the margins, as I have indicated, with the folds and creases that come from the margins outwards ironed down upon the tooth surfaces, will be given a stiffness and rigidity to the matrix that is stronger than the pull of contraction of the fusing porcelain, and there will be no warpage or misfit for that inlay.

The lack of sufficient pressure in burnishing is a very common mistake. The most delicate margin will withstand a heavy, even pressure without any danger of chipping, and the heavy pressure in burnishing will secure that adaptation that gives a perfect fit, the lack of which is apparent in so many inlays.

Wrong Conception of Color Selecting.

Most dentists select the color for their inlay in the same way that they select a facing for a crown or bridge. They take the shade guide of any make of bodies they are using and try to pick out a shade that matches the tooth. If they have been happy in their selection and think they have a color that is a match for the tooth, and bake the inlay of that body, when they put the inlay into the cavity they are surprised that the inlay is only a partial match, and I suspect they lay the failure to the body—that it does not make true to the shade guide—but the fact is the tooth varies in shade throughout its length. It will be deeper in color at the cervex and lighter at the cutting edge or occlusal. Most dentists have too many colors to

work with; some have all the good bodies on the market, thinking that from the multitude of colors they are sure to find one that matches the tooth.

The greatest mistake in reproducing the color for an inlay is too many bodies to work with. In addition to foundation bodies, eight different colored bodies is all any one needs to reproduce any color desired—three yellows, two grays, one brown, one strong blue and one light green. I would advise every one to cut out all other bodies and reduce their working outfit of colors to this number.

Select the colors and use as follows to produce results: The shade guide accompanying an outfit of bodies is simply to indicate that that bottle of porcelain will produce that color if you bake a piece of the same bulk as the shade guide. You can get any shade of that color, according to the thickness of the layer you bake. Now use the shade guide to find what colors are in the tooth and their comparative strength. In a general way select the general effect of the tooth from your yellows or green, with an occasional call for the gray (the light green is more gray in general effect than otherwise). Next, look for the gray, blue or brown that may be in the tooth, and all teeth have one or more of these colors throughout their length, and you will find and determine the strength of these colors by harmonious comparison—not that you will ever find gray, blue or brown as strong as the shade guide, but, holding the shade guide to the tooth, if that color is in the tooth, there will be a harmony between guide and tooth, and you can determine the strength of the color by comparison. Locate the colors found in the tooth and reproduce them in the inlay by baking a layer of that color in the corresponding part of the inlay. (Illustrated by typical light-yellow tooth.)

Defective manipulation of porcelain bodies in trying to produce the color effect desired, and failure to properly fuse porcelain bodies so as to obtain true porcelain with the maximum of density and strength.

As I have just indicated, the way to produce color effect in the inlay is by baking a layer of that body in the place wanted. Never mix two or more bodies together to produce

the effect desired. First, because you would have to bake a button of the mix to see the success of the mix; second, the result of a mix would be general throughout, whereas you want it localized; third, you could never mix twice alike, and every time you tried to produce an effect in that way it would be an experiment, while if you are producing your color effect by baking in layers you would soon learn and remember how thick a layer of the body was needed to give the effect desired. (Illustrated by model.)

One of the greatest defects in porcelain work is over-fusing—baking all the life out of the porcelain and having practically glass left. The great majority of dentists do all their porcelain work—crowns, bridges or inlays—with a body that fuses at one common temperature. The result is brittle, porous, glass-like substance. Every time porcelain goes into the furnace it will be carried a little farther along in fusing, and a piece of work that has gone into the furnace three or four times and is made of one grade of body will be hopelessly ruined as regards strength and density. Repeated bakings burn out the flux and result in porosity. Repeated bakings carry the fusing too far along and result in glass. I believe all porcelain work should be produced by using bodies of at least three different degrees of fusing. Beginning all work with what I call a foundation body, producing half or two-thirds of the bulk with the foundation body, the foundation body fusing at as high a degree of temperature as is practical to use, only carrying this fusing far enough along to produce a glistening biscuit, following with, and producing your color effect with a body that fuses at a lower degree of temperature and only fusing this to a sufficient glaze to develop the color, and producing the glaze you desire for a finished piece of work by a thin layer of body that fuses at a still lower degree of temperature—using three different grades of bodies, your successive bakings will not disturb those that have gone before, and you will have dense, true porcelain, with the maximum of strength.

Poor Cementation.

I have noticed in watching other operators, and have had

so many inquiries regarding what I fear must be a common mistake, namely, the mixing of too small an amount of cement to be able to make a good mix, and the putting into the cavity only enough cement to line the walls and margins. The last is the most common, and I suppose is done on the theory that the less cement there is in the cavity the less there will be to squeeze out in setting the inlay.

The trouble is that in putting the inlay into the cavity it is likely to touch one place and then another, and in doing so establish an air-space. The better way is to make a mix large enough to make free handling, and to flood the cavity full, so that when you start the inlay into the cavity it touches cement which begins to exude, and as you force the inlay home, it flows out all around. In this way you may be sure there is cement under all parts of the inlay. The excess cement will chip away easily.

REPORTS OF SOCIETY MEETINGS

THE AMERICAN ACADEMY OF DENTAL SCIENCE

February 7, 1912.

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, February 7, 1912.

The paper of the evening was read by Dr. Edward W. Taylor, entitled: "Trigeminal Neuralgia from the Standpoint of the Neurologist." (This paper is printed in full at page 137 of the present issue of *THE JOURNAL*.)

Discussion.

Dr. Brackett—I was so unfortunate as not to hear the whole—the first part of this paper—but I did hear considerable, and every bit that I did hear most profoundly interested me. I have long been especially interested in all of these matters; I have had some experience from which I have learned things slowly, and I have some ideas concerning the affection. Perhaps these ideas are crude, but I should say, in the first place, that the dentist in his average, ordinary examination does not always succeed in compassing everything which he should accomplish. There are dental affections that are so obscure, so concealed, that they do not respond to the ordinary tests.

A tooth appears on the surface to be in an absolutely normal condition, manifesting little if any reason for suspicion, and yet there are cases when a tooth of this description is really an offender. I have known several cases of loss of vitality, of disturbed and dying pulp, giving intervals of excruciating suffering over periods of months, and I only got my eyes open something like two years ago. In teeth that were absolutely sound, in teeth that had never had any filling, never had any decay, and never—to the patient's capacity to testify—never any blow or injury, I have seen cases where there were present in these teeth such conditions of irritation or disturbance of pulp, precisely of the character that we find in teeth that have been injudiciously filled.

In the case of two sisters: one of them had, I think, three or four cases in the latter years of her life—her life came to an end

within a few years after my first grasping this peculiarity in her case—and there have been similar manifestations in a lesser number of teeth in a sister of the patient.

A diligent application of the resources in our hands in making a diagnosis will reveal things which are not revealed in a hasty and superficial examination. Of course, the first thing liable to be overlooked is the cavity, a perforating cavity in a concealed situation, having very great depth. We have all seen instances of tiny transverse cavities having very great depth, cavities hardly more than a millimeter in transverse section, and yet having a depth to fill and an exposed pulp, the whole sequelæ of pain. I think if we apply searchingly and discriminately, in addition to everything we can make out by inspection and the use of exploring instruments, three or four different tests, most teeth that have anything pathologically wrong with them will in some way respond, and one of these tests, as the reader of the paper said, is percussion. A careful discrimination should be made about the responses of percussion, including the degree of resonance and its lack, and doing just exactly as is done by specialists in lung disease, going over and over again the comparison of the two sides. If a dentist makes his comparisons as carefully as he can between different teeth he often is able to make out something which would not be discovered with a less careful examination.

Then there is another test which I have found of great help, and that is, limiting pressure to a single tooth, which is admirably obtained by a patient biting a soft thing like a match, one tooth at a time, some tooth will respond. If a tooth is suspected I try putting it to this test, and often careful examination in this particular will reveal some difference.

One of the most dependable aids to diagnosis is a very careful, discriminating use of the temperature test. One can apply the temperature test to a single tooth with the application of a heated talc point, which I think is one of the best ways of applying the heat test. The one thing which I am sure is practised by you almost every day is gutta percha, heated and applied to the teeth for this heat test. I always begin with a tooth that is not under suspicion and go on to the ones that are suspicious and so get a sort of control. When one adds to this transillumination, when one notes whether any teeth are missing, then uses the X-

ray, I think that a large part of the pathology within the teeth themselves will be detected. If I had to rely upon a single test in these cases of obscure trouble, the one I would be most reluctant to surrender would be the temperature test.

The essayist spoke of a case parallel to one which occurred in my experience in the early days of my practise, which I have said over to every one of the classes in the School for more than a score and a half of years—more than a score of years, at any rate—which you have heard me describe in this room over and over and over again; and I will briefly repeat:

A gentleman of very superior mental capacity, well known by name to every one of you, came to me one forenoon twenty-five years ago, saying that he had been suffering excruciatingly for two weeks (under the care of a physician) with pain in his occiput in precisely the location which the essayist described, and had had various administrations of drugs without relief. His physician had suggested that it might be prudent for him to have an examination of the teeth, although no one suspected the teeth; but in order to catch at every possible straw, the gentleman came to me in the middle of a forenoon for inspection of the teeth. I saw a large buccal cavity of the third molar, with a broadly exposed and tremendously congested pulp, and the tooth was in a condition not to be of service to him. I believed that tooth to be the offending one. I believed the procedure to be extraction, that the instant the tooth was away his pain would be relieved, but the idea seemed preposterous to him; he came back, however, the next morning at 10 o'clock and he never had another twinge in the score or more of years that remained to him. I acknowledge with the utmost heartiness the tendency of every man to magnify his own specialty, and to believe that a large part of the pathological cases are in his particular line, but after making that admission I do sincerely feel still that a large part of the cases which we see and which pass for neuralgia are really toothache.

It is our experience that patients come into our offices day after day, speaking of having suffered severe neuralgic pain, when they really meant toothache; if toothache is not what they mean, toothache is what they have been experiencing.

I must not take up too much time, but I was very much interested in what was said of alcohol injections.

Several years ago a patient of mine, then about seventy years of age, began to suffer with excruciating neuralgia, which was brought on particularly by motions of the mouth in speaking or eating. She could get on for quite a time, so long as she was perfectly quiet there was no pain, although to speak or talk involved great suffering. For a long time she had to subsist on food requiring no mastication, and she had to be very nearly silent a large part of the time. She saw various skilled physicians, but the essence of the trouble was still there. I gained my first knowledge of some of these alcohol injections through the publication of an article in the *Cosmos*, and I instituted a correspondence with Dr. Killiani, of Fordham Hospital. I laid all the literature I had on this subject before the lady and her family, and they had an opportunity to be as conversant with all the literature as I was myself, and the decision was that they would test the treatment in this case, so that about a year ago now the lady went to New York and stayed for a considerable interval, and a number of attempts were made which did not succeed. After four or five trials, an attempt was made which did succeed. It succeeded for just the reason that the essayist presented, just the reason Dr. Taylor declared. The first ones did not reach the right spot that was required, but the last one did succeed in reaching the exact spot, with the result that she was entirely relieved, and remained relieved until the sixth of September, an interval of six or seven months. Then there was a recurrence, a rather severe recurrence, and when it could be conveniently managed the same relief was sought, with one or two unsuccessful efforts to reach the right spot, and finally a successful one with immediate and complete relief. This last effort, I should say, was perhaps in the vicinity of November, and she has been, from that time down to the present, so far as I have been able to ascertain, absolutely and completely relieved of this excruciating and exasperating pain which had made her life a burden before treatment was instituted.

So, as the essayist says, and Dr. Killiani declares, the failures are not on account of the theory not being right, nor on account of the inefficiency of the agent, but on account of the extreme difficulty of making the syringe point reach precisely the right spot. When that is accomplished the relief of the pain is almost immediate, and it is complete. While there are some moderate dis-

turbances experienced for a short time the relief from the pain is almost immediate. I do sincerely believe that it is a treatment that does have power to control these cases in a way better adapted to their control and more efficient than anything within the range of my knowledge as a dentist.

Just two other items which I will speak of very briefly, and to which, no doubt, the essayist made some mention before I came in.

I have found in my observation, and it is the observation of everyone with these cases, that manifestation of pain is most frequent in cases where there is a lack of good systemic condition, a lack of a well-nourished condition, or an undue burden upon the system anywhere, or upon the nervous system. I can make myself have neuralgia, and yet my lot has been as free from pain as any individual's during three-score years and ten—I can make myself have neuralgia by sitting up at night, by overworking, by eating my meals hurriedly, simply by what might be called a fatigue—and I get an attack of neuralgia, indicating very plainly the overtaking of my nervous system. It is a fundamental principle familiar to all of us, that the lack of proper nutrition or the lack of proper proportion between the nutrition and the demands which are made upon the system is the foundation of these conditions.

So far as this matter of sacrificing teeth is concerned, I do not think we have cognizance of such cases—sacrificing teeth—as often as we used, but we all have deplorable cases of extracting tooth after tooth with the idea that the teeth are to blame. It seems to me that a dentist, with his resources, ought not to extract teeth unless he can see a good reason for it; unless the neurologist and the general practitioner have exhausted their resources. To sacrifice a tooth when there are no indications of trouble in the tooth seems to me a thing to be avoided.

This is the final point upon which I wish to speak, the matter of reconstruction, the matter of redevelopment of nerve tissue. I suppose every one of us, in devitalizing a pulp, have had some patient come in and say, That nerve you killed is coming to life again; and we all of us have found sensitiveness on a given date, when a similar examination did not reveal sensitiveness a month or so before. This my patients have joked about. I wish the

essayist would testify if the actual growth of the nerve pulp can take place within the tooth itself. I hope it is a point upon which he will speak when he has an opportunity to close the discussion.

Dr. Briggs—It would be an expression of my opinion from my experience that trigeminal neuralgia has always to do with the teeth. That opinion, the essayist said, was held by some experimenters and writers. I should say that from my experience the trouble is in and about the teeth—of course, that means, as you all know, pulp stones, exostoses, gingivitis and pyorrhœa, and all the numerous things I cannot stop to mention now. The few cases—a half dozen I should say—I have seen in my experience where no trouble could be found in the teeth, it seems to me the essayist explains in this growth of the end organs after extraction. All these extreme cases that we have not been able to find a cause for, not been able to succeed in the treatment of, have been cases where extraction has previously been performed to a greater or less extent for the neuralgia without success. These cases have only been cured by operation, the resection of the nerve. In one case I managed to check the neuralgia for ten years by boring down to the nerve and scraping there thoroughly, and without any real evidence of what was being accomplished, but the result was good, so the patient was free for ten years. At the end of ten years there was a recurrence of the trouble, the patient went to the neurologist, but the operation did not seem to be satisfactory. The patient drifted away and I do not know what the end result was.

One case I saw in consultation with Dr. Hardy. We could not find any means of relief. Finally, at his suggestion, the patient went to Dr. Cushing and had the gasserian ganglion removed very successfully. Dr. Cushing can correct that if it is not right.

I had a case of an old lady with trigeminal neuralgia. There I laid back the flap and bored down on the bone to the spongiosum and, from the time of the operation—the operation was done under novocain (I do not know whether that gave the relief or the operation), the patient was only relieved for about a week.

When I say trigeminal neuralgia I do not mean toothache. I mean real neuralgia, or a case of tic douloureux, and it has seemed

to me that they must all of them go back to the jaws and to some cause in and about the teeth.

I have nothing to say on the other technical points except Dr. Brackett's reference to the many ways of testing. It occurred to me, perhaps some of you do not realize how important this heat test is in these cases, how easy it is to get it by running a rubber disc on the engine for a minute or two.

I congratulate the essayist on the very interesting and thorough presentation of the subject for which I am very much indebted.

Dr. Miner—I have been deeply interested in this subject of trigeminal neuralgia for the last three years, and I appreciate very much Dr. Taylor's exposition of the subject. I was interested very much in what he had to say about the formation of these small neuromata, for a German writer within a year has called attention to this in some of these cases in and about the mouth, where we get, after extraction of every tooth, a subsequent tenderness along the alveolar ridge, where pressure will start this sensation of pain.

There is another thing that reminded me of some studies I made a couple of years ago in regard to the relation of the roots of the third molar to the inferior dental nerve. I found that in about half the cases one or more of the roots of the lower third molar actually penetrated the inferior dental canal, and, naturally, it seemed to me, how easy it would be to cause a rather serious injury to the inferior dental nerve by extraction, with possibly subsequent attacks of neuralgia.

There is another thing that occurs to me, in reviewing the cases, that—in this, perhaps ludicrous as it may seem, I differ from Dr. Briggs' opinion—in the true trigeminal neuralgia the pain is quite different from the pain we get from impacted third molars, pulp stones, or various affections of the teeth. I recall several cases I have seen in the last few years, and one or two especially striking; one, which I have seen recently, one in which I thought I could detect these tiny little nodules, pressure upon which produces the neuralgia. I think I had a true case of these tiny little neuromata. There is another case I have seen recently which was due to prolonged irritation and infection from an ill-fitting plate. The teeth had been extracted, from the fact that

they had been neglected, about ten years ago. From that time he has had considerable trouble from a badly fitting plate, and on the right upper side, between the cuspid and the first molar, he had a region, he said, for several years, absolutely raw. The tissue in the vicinity at the time I saw him was healed, but there was a plain cicatrix there and dense tissue, which showed up like a scar anywhere else, while showing very white, and surrounding this scar tissue was an area of acute inflammation. There was another case which I never could understand, which, perhaps, Dr. Taylor in his discussion can clear up for us. A woman who had a true case of tic. The teeth had all been extracted, X-rays taken, etc., nothing could be done. She complained at the time her pain was worse in and about the head, though she also had some backache, and, thinking there might possibly be some reflex cause I sent her to an orthopedic surgeon. He found the joints very loose. He immediately took steps to correct that condition and the pain immediately decreased in severity and the condition improved. I followed her up for about three months and she very much improved. I have lost track of her since, and I do not know the outcome of the case. This case was interesting, from the fact that apparently the cause of the pain in the head was so far removed from the location of the pain.

Dr. Doubleday—Dr. Taylor, referring to pulp stones, spoke of our being unable to find them by the X-ray. I think in most cases they can be distinctly seen with the X-ray—in almost all of the cases.

Dr. Brackett—I should like to hear from Dr. Andrews.

Dr. Andrews—I have been exceedingly interested in the paper of the evening and I wonder if we realize that filling very often will cause uneasiness in teeth. Fillings are, to a certain extent, an irritation to a normal pulp, and large fillings may cause a very great change in the pulp. I had that illustrated in a certain case I had where a very small gold filling could not be worn in any tooth in this lady's mouth. She could not bear it; they caused excessive pain and they had to be removed and replaced by gutta percha, which seemed to be worn much more comfortably. So we sometimes have these irritable cases. Of course, we are all aware that the pulp of the tooth is in a prison house. Naturally, if there is any swelling, it is going to swell at the expense of the

pulp cavity. Of course, there are many nerve filaments there. Now, if we examine that pulp microscopically we see a multitude of nerve filaments running all through it, but we shall be surprised to see how there can be any nerve tissue so full of nerve filaments, and it is also so with the blood vessels—the nerve is full of capillaries. I only say this to show that irritation from the outside of any nature, by filling or anything else, may start some of the connective tissue elements to forming and taking on the work of the osteoblasts and forming a little center of calcification that grows against it and irritates it; not much, perhaps, but enough to irritate it, and continuing to grow there from the sides of the teeth, odontoblasts, or from the connective tissue in the nerve and cause a good deal of irritation and inflammation in the pulp. Sometimes it is hard—it is one of the obscure cases—but it can be found by proper methods of examination. The pulp, as I say, is full of these nerve filaments, and these become irritated and cause neuralgia.

Some irritating cause, perhaps too hard occlusion, may start the connective tissue to take on osteoblasts, and we have exostoses. All of these growths are the cause of irritation to the parts. I doubt whether we realize the number of pulp stones that are in the teeth. I think Dr. Cooke read a paper before this Society in which he showed hundreds of them, a bottle full, which he himself had found. I know this irritation from filling does cause different forms of this kind within the pulp; large growths sometimes, almost closing the passage of the pulp and pressing against it.

These are some of the cases that come to my mind just at this time. So much has been said, and so well said, it has left very little for me to say, but these thoughts happen to occur to me and I do not know but what you are all familiar with them; but they certainly are the cause of many of our troubles.

President—Is there any further discussion of this paper? If not, I will call on Dr. Taylor to close the discussion.

Dr. Taylor—Gentlemen, just a few words in reply to what has been said. The discussion has been most interesting and illuminating to me, and I feel somewhat gratified that many of the ideas which I advanced tentatively have been borne out by the remarks of the various speakers.

In regard to Dr. Brackett's final question, as I said before,

I think you all know a great deal more about that than I do, since I speak from a theoretical standpoint. It does seem to me probable that the recurrence of pain which Dr. Brackett has described must be due to the outgrowth of a nerve presumably dead. The pulp cavity, the pulp itself, as Dr. Andrews has most admirably stated, is extraordinarily sensitive, and a slight tendency to re-growth in that region would, I should think, be an adequate explanation of the symptoms which you have observed. Dr. Briggs was, of course, very radical in stating that he considered that practically all of the neuralgias were due to difficulties in the teeth or jaws. I doubt whether we can go quite so far as that.

Dr. Miner's remarks particularly interested me in what he said about neuromata; there, again, I was speaking theoretically. It does seem to me that the matter might be relatively easily proved. If, for example, you can follow cases to the autopsy table, as we are privileged to do, and make studies of clinical conditions observed during life, it seems to me that you could prove these points pretty definitely. It would be desirable, if possible, to make actual anatomical studies of the condition of the nerve after destruction, particularly in those cases where pain had persisted in regions when apparently the irritating cause had been removed. I was also very much interested in his attempt to differentiate between neuralgia derived from the teeth and what he termed the idiopathic neuralgia or tic douloureux. I do not suppose Dr. Miner would maintain that such a differentiation could be made in all cases, but the suggestion he offers seems to me to be one of great practical utility.

I was glad to hear what Dr. Doubleday said about the pulp stones and the X-ray. I did not know that fact, and it simply shows the advance which has been made by the dentist with the X-ray in work of this kind.

I have spoken already of Dr. Andrews' description of the pulp, which I think very interesting and instructive, and it again demonstrates with what a delicate structure we are dealing and how prone it must be to register disturbance of various sorts.

Adjournment.

THE AMERICAN ACADEMY OF DENTAL SCIENCE

MARCH 6, 1912

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, Mass., on Wednesday, March 6, 1912. The paper of the evening was read by Dr. Percy R. Howe, of Boston, entitled: "The Oral Secretions." (This paper is printed in full at page 147 of the present issue of THE JOURNAL.)

Discussion.

President F. A. Delabarre, D.D.S.—It seems to me that a Society of this kind should offer every encouragement to men who are willing and anxious and able to do research work in any particular line. It is a matter of regret to me that our Society has not yet followed the lead of the societies in New York and established a fund for the purpose of encouraging and of doing research work.

In looking over the whole field of dentistry I can see no subject which bears more latent possibilities for widespread change in our professional activities than this subject of oral secretions, and this applies not only to our own profession, but it seems to me that further study of the oral secretions, the alteration of the oral secretions under certain conditions of diet and changes due to physiological and pathological changes in the body, will be a tremendous advantage to the physician in diagnosis. There is no reason to my mind why analysis of the saliva will not be just as valuable in diagnosis to the physician as the analysis of the other secretions of the body. The practical application of the results of original research in this line will be very far-reaching, and I trust that the future will bring forth something that will wake this profession up out of the condition in which it is plunged to-day with the purely technical side of our work, with repair work (which in itself is not and never can be progressive). In doing repair work as we all do—coming into our offices in the morning and going out at night with little else accomplished—we are not going into the problem from the right direction.

In the last few years prophylaxis has been the watchword of our profession, and it seems to me that along this particular line we are discussing to-night, prophylaxis can get some aid to further its own needs, and prophylaxis is going to be one of the greatest fields of our endeavor in the future.

The subject is now open for discussion, gentlemen, and the chair will call upon Dr. H. Carleton Smith.

Dr. H. Carleton Smith—I am always interested in this subject of salivary analysis, and when I first received my notice of the subject of this meeting, the first thing I did was to take down my January Cosmos and re-read the article by the essayist on the effects of diet on the analysis of the saliva.

My position as a teacher perhaps makes me a little critical, but I cannot find fault with anything in that article. Then I read in the March number of the Cosmos Dr. Howe's article on indicators. I am not going into that to-night: he has referred to it. I will read the closing sentence, because it is about as good a thing as I have seen; and I will try and explain why I think so. He says: "These facts, together with the above mentioned indicators and the use of the titration procedure, give to the determination of oral secretions an accuracy in keeping with chemical investigations in other branches of science."

Now, gentlemen, it seems to me that is just the one point where we, in the dental profession, are not doing all that we ought to do. In this question of accuracy of chemical investigation we certainly are getting a great deal of information which is not true in our journals, and I think we should congratulate ourselves, the Society should congratulate itself, that we have in Dr. Howe a man who has shown himself to be a careful and accurate investigator. It is the one thing we need. Now, as I say, we are getting a large number of statements, or we are seeing them in our dental literature, which we are obliged to question, and if you will pardon the use of an illustration which I used only recently. I think I can show how easy it is for us to be led astray, and I can conceive no other way in which these articles appear.

I took down this bottle from my laboratory to-day marked litmus paper, with which we are accustomed to test the action of the salivas. I tested a number of salivas, and now I want to suppose a case.

I might come here to-night and say : I find that we have made a mistake about the reaction of saliva ; instead of its being an alkaline, as always supposed, I find it is strongly acid. Now if I test my own saliva with this paper it shows a pink reaction. Perhaps it won't be very apparent from where you sit. I might go a little further and say that I find the water we have been drinking is acid in reaction, and we see it turns the paper a red almost immediately. Is not that a good acid reaction? Perhaps you would like to test some of the water you have been drinking to see if it is strongly acid in reaction. Now the idea is, as of course you all see at a glance, that this paper is not litmus paper. I cannot tell it from litmus paper ; it looks like litmus paper ; it is labelled litmus paper, and we can very easily be misled in this way or in other ways.

I read an article in a dental journal, in the Items of Interest, which made statements just about as far off from the facts of the case as this statement I have made about the drinking water, just about as far off from the truth. I think perhaps you remember the article. The statements in that article were simply absurd. It stated that the ordinary cane sugar was strongly acid. My idea is that statements like that, coming from a scientific body, are not conducive to the highest opinion of that body by other scientists. We have heard articles here—not to-night, but in times gone by—which have not been carefully worked out, and even in the November Cosmos we find a method for the determination of potassium or the existence of potassium in the saliva, based upon a method which is absolutely erroneous. It cannot give us accurate results. Dr. Ferris has incorporated that (under the author's name, to be sure), but it is a method any chemist with two years' experience in the Massachusetts Institute of Technology would know could not give accurate results.

Now I consider the chemical work in the saliva is one of utmost importance. I feel that this point which Dr. Howe has made to-night, to the effect that the lactic acid bacillus may find an active culture in ammonium phosphate, is a very important point ; it is one which will bear study and experimental work.

Preventive medicine to-day is the great proposition in medical circles. Oral hygiene is the major part of preventive medicine, I believe, and I think some of you believe it. If we believe that,

how great is the importance of doing what we do accurately and scientifically?

The President has suggested that a fund might be raised just as the New York Institute of Stomatology has done, keeping some young man or some graduate in some school doing a considerable amount of experimental work. This has been talked about in this Society before; it has been talked about in the State Society, and it has been talked about in the National Association. I wish it might be done.

I would like to ask Dr. Howe just one question, and that is, In testing the acidity of these various salivas, have they been tested before and after boiling? I ask that because in my own classes, I find the acidity of the saliva is often due, in fact, more often than to anything else, to the presence of carbon dioxide. In a few cases we have acidity of the saliva, but the acidity is often due to CO_2 , carbon dioxide, and that by boiling perhaps five or ten minutes we may drive off all the carbon dioxide, and that the solution will be alkaline to litmus, and so I would like to ask Dr. Howe this question.

Dr. Doubleday—I have nothing especial to say, except that I received a great deal of pleasure in hearing Dr. Howe's paper. The moment I heard of his paper I was very glad that I had planned to be here, and then I was asked to say a word or two. I found it was wholly out of my line, it was entirely chemistry, and in the little work I had done on the saliva I had worked on the crystallogical elements. Of course, that is in the line of chemistry, but all the work I have tried to do along the salivary investigations has been along that line. I have tried to make more or less chemical tests, but in doing this have found the reagents had deteriorated, so that the tests for ammonium, sulphur, lactic acid, chlorides, etc., have not been satisfactory at all, and therefore I have given my entire attention to the crystalline elements found by direct evaporation as well as by dialyzing the saliva, and have merely compiled these for tabulation. I have found a great many crystals that have apparently been phosphates, but have been unable to find any one, looking through the microscope, who can tell me positively whether they were phosphates or not. After hearing Dr. Howe's paper and his remarks as regards the technique whereby he feels he is assured as to the results he has ob-

tained, I simply want to get over there and see if we cannot get together, and I know I shall get a great deal from what he has done. In chemical tests I have tried to make, the reagents used, to my mind, were absolutely worthless, they deteriorated too fast to be of any especial value, and so I have given up interest in this line and feel that from Dr. Howe's paper, if he is satisfied enough with his results to be willing to keep on, as he is, there certainly is something to be gained. I should like to see how he has made these chemical tests. I have made them by the technique given us by Dr. Michaels, of Paris, and Dr. Ferris, of Brooklyn. I have nothing to say except in commendation of the essayist's paper, and have appreciated and enjoyed hearing it very much indeed.

Dr. Smith—Mr. President, if you will pardon just one word more, and that is, in the methods of these chemical tests with which Dr. Doubleday finds so much trouble, it may be that the accuracy and thorough chemical investigation of saliva will prove to be a matter for a pretty thoroughly equipped chemical laboratory. But if you do undertake chemical analysis, I would suggest and urge that you do it along the lines which have been laid down or accepted by the National Association, the point being that we are suffering to-day because for ten years back dentists have been analyzing saliva, each according to his own methods, and it is very much better that we should have uniform methods for doing the same thing in the same way and then our results will be comparable and we shall arrive at definite conclusions in a fraction of the time in which we shall if we keep on as we have been doing. Chemists in other lines do this in this way; food and agricultural chemists always get together and formulate methods, so I would urge that we use Dr. Ferris' methods, which appear in the November Cosmos, for our methods for the current year. Dr. Ferris spent several hours in my laboratory recently, and I did not hesitate to tell him that I thought his methods were not the best, but I was perfectly willing to use them until we agreed upon better methods.

Dr. Werner—While I am not a chemist and cannot analyze the saliva, I realize that hygiene, thorough development of the teeth, and knowledge of saliva concern us all very much; they strike directly at the root of our professional calling. Now, looking at it in a broader sense, modern man with all his trouble about

his teeth cannot correct that trouble by simply analyzing the saliva. Don't think for a moment that I speak disparagingly of it; I do not think so; it is a very essential part. We want men like Dr. Smith and Dr. Howe to do this. It must be done, but it is only one factor in the problem. Dental hygiene that we hear so much about in its practical results should lead us into what? Into looking for the cause of dental decay.

Now dental hygiene means activity of the mouth, doesn't it? You clean your teeth and you are producing an active condition. Clean teeth, as we heard in the public hearing at the State House this afternoon, do not decay. The civilized man of two or three hundred, or even of a thousand, years ago did not have very much tooth decay. He had no more dental hygiene than you and I have to-day; he did not analyze his saliva; he did not have the tooth powders or even a tooth brush, but he did have and did practise every day, what is better than dental hygiene, and that is dental activity, tooth work. Now, as long as we get wholly away from that tooth work, we will have this prevalent dental decay. All archæological excavations show us plainly that there was no tooth decay two or three thousand years ago; not very much one thousand years ago. The Egyptians, the Syrians, the people in Northern Africa, people in Southern Europe, the people in Asia, where you and I think that we came from, the Aryan stock, they did not have tooth decay, they did not have the watery secretions we have to-day. They had the same kind of saliva, molars and bicuspid, and they had also force; that is why they did not have decay, not because they had so much lime or phosphorus or so much else in their constituent parts. They had the material, and that material was brought about by the activity of the "dents" organ. I am speaking now of the Latin word dents, the Latin word for tooth.

With all our activity at the State House in regard to the dental nurse, not one word in that direction resulted. To my mind that seems very typical of our narrowness. All professions become narrow, particularly specialties; you do not look any farther than the finger-end work. Now, if you are going to teach children how they should have better teeth you must do more than describe saliva and mouth washes; do more than the dental hygiene work that a dental nurse should do—much as we need her, and I

advocate her—you have got to do away with your own self-indulgence to your own child. You soften its cries; you feed it on pap from the time it leaves its mother's breast, or bottle nipple; you give it a rubber nipple now to keep it quiet; it no longer has its mother's breast which it has to milk; you do away with that. You have got to build up your dental organism again as it was when men were just as civilized as we are now and a little bit more; when they were very much less mentally and physically degenerated than we are to-day.

When I think of my great-grandfather who, I am sure, used no tooth brush, never thought of such a foolish artificial thing as that, I know that he did use his teeth regularly when he ate his three or more meals a day, and that prevented the necessity for the use of the tooth brush and the need of a dentist, as we have. If I had again to bring up children, as I did once twenty years ago, I would be a little bit wiser, and when they left mother's breast, or rubber nipple, they would have to work on their food and no mother or nurse or kind parent would supply them with the eternal American pap. For, remember, that in America, more than in any other country, we are pap fed, and that to my mind is the third factor we want to talk about. One is the chemical factor, the second is the hygiene factor, and the other is the building up of the dental organ, to make better development when the acid will not have a particle of effect on the well-formed tooth substance.

Dr. Paine—I know that we have all listened with a great deal of interest to the essayist. Most of us are not investigators—we are practical men. I mean by that we start work in the morning at 8 or 8.30 and work until dark correcting evils in the mouth, and we have a paper given us like the one to-night, telling us that the excessive amount of phosphates in the saliva produces an increased amount of decay or along that line—and there the paper stops. Our essayist does not tell us what we are to do to lessen that amount of phosphates, how, through his investigations, we as practical men, by the treatment which should be given to us, can take advantage of these investigations. I mean by that, the paper is purely theoretical, accurate as to chemistry, but it does not give us the remedy. I have listened to a great many papers here in the Academy and have been disappointed along that line.

As I say, I am a practical man, and I think we would like to know how to correct these conditions in our mouths and in the mouths of our patients, what the essayist would advise us to do. After finding out what the troubles are, if he would tell us how to correct them we could use it to the advantage and to the benefit of our patients.

Dr. Smith.—Mr. President, if you will pardon me I want to ask Dr. Werner in what different manner he would bring up a group of children than he did the last one, and I think if he answers that question it will appear that it is not because Indians or civilized man one thousand years ago did not do as he says *we* do. I will agree with what he says about the uses of mastication, but it is because we are learning these things, because such men as Dr. Howe here have spent so much time in investigating the amount of phosphates in the saliva and other investigations, and although he cannot tell us just now or give definite reasons or methods of correcting the evils, we are finding out what the evils are and are gradually learning how to correct them. After we have located the source of the trouble we may be able to correct it.

Mr. Howe—I am a guest of the Society to-night and I did not intend to say a word, seeing that my work is entirely in the line of chemistry. I was much interested in the paper this evening, and I think, if that is a fair sample of the papers you have on the side of investigation, you are certainly to be congratulated.

One of the speakers said you did not have the remedies at hand. It seems to me that it is asking too much at the present time to ask for all these remedies. A person to do this work successfully must be, it seems to me, a bacteriological physiological chemist, and to do that work successfully would require at least eight years of training before he could start out well equipped.

Another speaker spoke about the question of methods. I am rather surprised to think that your Society has no standard methods to go by. You spoke about the chemists. We have an organization which meets once a year to standardize our methods for that year. If I may be allowed to suggest, I think it would be well for your Society to appoint a committee, and the committee could meet each year at some central point to formulate the standards for that year.

After you find the causes then, of course, you can apply the remedies, but not until then, and it seems to me it is going to require many years before you can arrive at that position. If I may, I should like to ask the speaker of the evening some questions. I believe he spoke about the influence of phosphates on the lactic acid fermentation. Do you know what lactic acid fermentations were present, Dr. Howe?

Dr. Howe—No; I do not.

Mr. Howe—Of course, you are aware, doubtless, that there are about 300 varieties present and that they give different acidity.

Dr. Howe—That is a new thing I came across at the Massachusetts Institute of Technology, and I was quite interested in it. I arrived at them by studying up fermentations. Of course, bacteria are always present in the mouth and get up considerable lactic acid fermentation.

Mr. Howe—That is right along the line of our friend, the cow. The mouth of the cow is the source of most of the lactic acid fermentations.

Dr. Howe—I asked Professor Prescott if anything would be gained by taking special cultures, if there would be any present in the mouth, and he thought I was getting a more natural condition.

Mr. Howe—Have you studied the influence of motion on the lactic acid?

Dr. Howe—What I have been particularly interested in is what you have been speaking of, the forming of acid and of chemical analysis. This indicator is, in part, being adopted by the National Association and is incorporated in Dr. Ferris' work, with some additions, and, as I say, I have been working out a system of analysis.

Mr. Howe—One other thing I would like to speak of. Dr. Werner, I believe, spoke about this being a pap age. I wonder if you realize, for instance, the influence of a dinner such as we have had here to-night? There is no question but that our method of eating occasions different chemical actions; things we eat have a very marked influence on the saliva. It depends entirely upon whether we have a simple or a complex diet, then, of course, the effects of the work of the teeth would have a marked influence.

Dr. Werner—I wish we had more men like Chemist Howe

(who is a brother of Dr. Howe) and Chemist Smith. I wish we had a committee to do original investigations. I wish we could expend our superfluous funds in that direction.

Then, going back to the question that Dr. Smith asked me, how I would change the bringing up of my children. On one thing I think I would take a very decided stand, there would be less cooked food used. Now I eat certain things every day that are not cooked. I love to eat carrots, and turnips, and raw cabbage, lettuce, etc., in distinction from any of these things cooked. Now a child can get a very great deal of nourishment from these things. Cannot he do so if you add a little amount of olive oil and lemon juice to flavor them? Won't you have a pretty good diet for the teeth, for the stomach, and for the question of health, physiologically and mechanically carried out? Dr. Howe was going to show you the picture of a man who lived in Italy some thousand years ago who was very wise in diet. This question of diet is not very new; we think it is new to-day, but this question interested the people of six, seven, and eight thousand years ago, who were just as civilized as we are, and very likely in chemistry, in practical chemistry, they could teach me very much and perhaps even you a little bit; for certainly in engineering they could teach us much. If we read the records of Egypt we see they were very civilized in mechanics; and they were, of course, also very civilized in diet and health questions. So the practical question is right on us, How shall we change the diet? I advise my patients' children to be brought up with less cooked food, for I think we can afford to lose its natural alcohol that we get when we cook it; but you know the regular diet that we Americans eat tends in the other direction. It is no longer a kitchen, but a kitchenette that we use, we buy things already cooked and they simply need warming up. It is not the way for a civilized nation to progress; it is not necessary to have these things cooked in the way they are cooked; it is not necessary to live on pap; it is not necessary to have the variety of things we eat, but it is necessary to have certain ingredients so that our muscles and our teeth can work their best.

Another thing is, how much handicapped we are—just as Dr. Smith tells us about the litmus paper. This paper that we get is not good for anything; it is not reliable. I find that the litmus

paper that I have is just as poor as his; it is not litmus paper at all; perhaps what I buy is not good litmus paper, but that I know that it deteriorates, for certainly you have got to keep it in the dark and well corked.

Now we can all do something to neutralize the acidity of the mouth. You know that common bicarbonate of soda will neutralize the acidity of the mouth, that it should be an ingredient of the tooth powder, and we know that medicated, fine powdered pumice is a safe thing in your patients' hands, rubbing it on the teeth with a little stick, and if you medicate it, it will change the stimulation of the saliva. A child likes a little annis mixed into the pumice in proper proportion, and it is my practise to give that as a tooth powder to my patients, particularly the little children when going through their second dentition, when the green deposit of bacteria lodge around the necks. We must not get bacteria-frightened. If we are not all bacteriologists, we can all know and remember every day that out of the 200 bacteria that infect the human body there are only 15 or 16 that we need to be at all afraid of.

Then fear or anxiety produce changes in the saliva, they cause changes in the urine, changes in the gastric juice or biliary juice.

Just let us reflect that in a few years, in the few years that some of us have practised—I have practised nearly 40 years—there have been great changes. I remember it was a pretty rare thing to find a six-year molar just being erupted that needed filling at once. I find it now almost the rule, hardly the exception, even in a physically well developed child; almost all need filling at once, or in another year or two they need filling. Now we must do something to counteract this. I think we ought to have, in a Society like this, a fund to be expended for such investigations as Dr. Howe is doing. Why not appoint a committee with Dr. Howe, Dr. Doubleday, and Dr. Smith as members? Have them considered an honorary committee. If I were able to work on it I certainly should be glad to do so.

Dr. Howe (closing)—It would take so long to answer all these questions that it seems impossible to more than touch on things.

In regard to Dr. Smith's question, of course after finding that

the saliva is acid, we want to know what the acidity is, and that test would differentiate between the inorganic and the organic. I went all over that ground; I do not remember the details of the thing now, but I did review it, and you will see in that test that I found an inorganic acid, very delicately acid, of course. What it is I do not know, probably phosphoric acid, but very delicate. I would be very glad to give any one who has done any work on it the details.

Dr. Doubleday spoke of some of the difficulties—of his doubts as to whether phosphates, or something else, could be determined. It can be determined very readily if it is phosphates, and if he will come over and see me we will settle the matter.

Now, in regard to my showing for the first time an active agent in the saliva. More or less work has been done, but we have never found what quality in the saliva made the bacteria active and what dormant. There are a great many present continually in everybody's mouth, and the reason we want to know is because they become active, and from many experiments I am sure I have found phosphates have much to do with it and sulpho-cyanide of potassium. I cannot conceive of any way in which it is an active agent. We could get sulpho-cyanide sufficient to see it in the saliva, but it is impossible for any substance to be taken into the mouth, broken down and taken up in the tissues and still come out in the gland just as it went in, unless it is a foreign substance and something which is eliminated as injurious.

Of course, Dr. Paine, I cannot give you right off now anything definite as a remedy. Phosphates might not be the thing, but certainly they show a very great decrease in acidity, in the laboratory, and it is a fact well worth considering that they can be used as a specific. We know that nervous people always have a lot of phosphates in the urine, and by taking a child and analyzing the urine, the saliva, and the conditions in the intestinal tract, I think we could do a great deal toward cutting down the phosphates. The phosphates in the food go through the system and come out as phosphates, and it is not lack or excess of phosphates in the body; it is simply systemic. In the working of the system many things bring it about, over or under feeding, irregularity of feeding brings that about, as I say, stasis of the bowels or fermentation. I think if one analyzes the saliva and follows it along—I

have done it that way—I think we can cut down the phosphates.
Adjournment.

AMERICAN ACADEMY OF DENTAL SCIENCE

APRIL 3, 1912.

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, on April 3, 1912. The paper of the evening was read by Dr. J. Lowe Young, of New York City, entitled "The Restoration of Normal Occlusion by the General Practitioner." (This paper is printed in full at page 190 of the present issue of THE JOURNAL.)

Dr. Young—* * * When asked to come I assumed that the Society being composed largely of general practitioners, I would be more liable to a discussion of my paper if I read something of mutual interest to both the general practitioner and the orthodontist. I have therefore selected the title which has been announced by the President, and in doing this I feel that I am really on dangerous ground in one sense of the word.

Now I take it for granted that for the best interests of our clientele that few of you attempt to correct malocclusion as is done by the orthodontist. I may be wrong in that, but I sincerely believe that a man who is busy in general practise is not capable, as a rule—there are exceptions to every rule—of intelligently coping with the difficulties involved in pronounced cases of malocclusion.

(Reads paper.)

Discussion.

Dr. Rogers—Now that you have had an opportunity of more carefully examining the results of Dr. Young's work along this particular line, I will speak very briefly. Of course, I feel strongly regarding this subject, as does Dr. Young. I realize fully that in order to have uniform success in the correction of malocclusion we must have the co-operation of those who are engaged in general practise. I believe that dentists should be artists in the broadest sense of the word. To my mind, there is no profession where artistic qualities are needed more than with us, in order that we

may, in our work, reproduce artistically and exactly lost tooth surfaces. I have had this fact emphasized by a few experiences resulting in the failure of corrected cases of malocclusion where flat inlays have been placed on the grinding surfaces of the molars—inlays that to me looked well at the time and were considered quite beautiful pieces of work—but after a little instruction from Dr. Young I could readily believe that these were not up-to-date, and that no inlay is really artistic and scientific that does not reproduce the anatomical landmarks of the tooth exactly as in nature. I am glad Dr. Young has had the opportunity to present this, because I believe that the members of the American Academy of Dental Science will become enthusiastic in the application of the principles laid down in this valuable paper.

Dr. Ainsworth—Mr. President and Members—I find myself practically in accord with all Dr. Young and Dr. Rogers have said, but this is a subject which, while very interesting, has a practical side as well as an ideal side, and unfortunately we have to deal with the practical side. Now, an ideal side may not be practical, and vice versa, because we are dealing with sensitive tissue.

There is another point to the problem—we may be artists, and if we have an inanimate subject to work on we may produce the most artistic thing conceivable, but when we have sensitive tissue to deal with we have to consider them, or the patients will not consider us, and there are other factors which enter in this problem—that mouths and teeth would be infinitely more comfortable, more useful, less likely to decay, and would retain their proper relations to each other if the dentist appreciated the importance of true restoration and if they were able to make such restoration. No practical, thoughtful, up-to-date dentist would doubt this. But there are several kinds of dentists and several kinds of patients to be dealt with. Unfortunately, we have to deal with living tissue, sensitive tissue. The most skillful dentist ever known cannot, and will not, undertake to do all things at all times, and his appreciation of the right thing to do must not be judged by what he may have done in one case or another. Fine dentists cannot always make fine patients or fine operations. I am sure we must do the best we can under the circumstances. Perhaps the most important relations called for are the proximate or mesial and distal occlusions, so absolutely necessary for proper occlusion. Why

it is that these restorations are not more commonly appreciated is beyond our comprehension. Perhaps the dental schools are to blame for not recognizing their importance, or it may be in the methods they teach, and we do well to preach the gospel of these restorations at all times and on all opportunities.

Occasionally there comes under our observation a perfect or almost perfect natural set of teeth; the grooves are ideal and the cusps are all as nature designed them; the relations of the upper to the lower are perfect and consequently, the relations of each tooth to each other in each arch is perfect. But these cases are very rare, indeed; when we see them we linger over them in admiration. The cusps are most beautifully designed for the work they are to perform; the Gothic domes presented by a section cut from them is something wonderful. Of course, we would like, in our orthodontic work, to establish that sort of relation, but it is not always possible for many reasons.

The amount of mesial occlusion has seemed to me of lesser importance, but when conditions permit should be carried out very particularly. With advancing age they do become obliterated to a large extent, but the subject, as we are discussing it to-night, has to do mainly with another class of patients and under conditions harder to overcome. In restoration of the contour, the detail must be in gold, porcelain, amalgam, and these fillings, excepting the latter perhaps, are hardly admissible in mouths under 15 or 20 years. At the age of orthodontic treatment we usually find teeth at the maximum of sensitiveness and the patient at the minimum of endurance.

The advantage of the gold inlay has a bearing on the subject, and with a little more progress on the subject of cement we may find it possible to employ gold inlays to still further advantage. One great drawback to gold inlay work for these patients is the necessity of sacrificing good tooth material, and also the amount of suffering attending the cutting away.

Many times it is easier to prescribe ideal relations than it is to produce them. I would not defend the dental work that we see so often that is very hastily or slovenly done, with no regard to the restoration of feature or contour, either mid-distally or on the grinding surfaces. Of course, if it were possible, or if it were probable, that we would have in these cases very large cavi-

ties that could be filled by gold inlays, there would be little question as to what would be desirable or admissible. At that age we often find a pulp occupying a larger proportion of the tooth than it does later on, and in cutting away to make large fillings on the mesial, proximal, or distal surfaces, one runs great danger of exposure of the nerve, and I have hinted at the pain of preparing the cavities. At that age the cusps are usually very marked, and it is quite possible, quite practical, to reproduce them in their entirety; but the cases where we see inlays most are the older cases, where we find the cusps already worn down to some extent, and where the relations that are established—the occlusal relations—must be considered. We oftentimes make a filling or an inlay in a molar tooth where we cannot restore the actual shape of the tooth on account of the occlusion; the way the tooth meets the other is not ideal. Now, what should we do in those cases? If the mouth were never to be closed we could reproduce the ideal shape of the grinding surface of that molar, but when the mouth closes the patient is in trouble and we are obliged to grind that inlay down so as to conform to the opposing tooth. At times we find it an advantage to grind the opposing tooth to some extent, but were we to consider these cases only in an ideal way—cases that are under treatment, orthodontial treatment—then we might be permitted to make restorations to a very large extent; but the difficulties in doing this work are great at that age, and while the teeth are sore they are not very suitable. This would seem hardly practicable in many cases. It may be that I am taking a wrong conception of these cases; Dr. Young may be considering only such cases as he has in hand, while I may be considering older cases. I certainly have had to do with a good many cases where the occlusion has been very much interfered with by improper filling, improper surfaces, but my thought has been given more particularly to the contour of proximate fillings, and I confess I have not been educated up to the full appreciation of these occlusal surfaces. I have a set of models here that show some inlays that were put in some time ago, after the case was regulated, that present a very nice occlusion, but they do not go into such extensive detail as Dr. Young has suggested. I am inclined to think that what I have heard to-night will set me to thinking a little more on the subject. There is a chance for an

honest difference of opinion on the subject between the orthodontist and the general practitioner of what is practical and therefore what is ideal for any particular case.

The paper has been very interesting to me, and I want to thank Dr. Young for his painstaking, not only in the paper, but in the models he is showing. I think they will be a source of a good deal of education to us.

President—Dr. Rogers has a little to add to his discussion.

Dr. Rogers—I want to say that I took the liberty of marking the lower model, and I want to say to Dr. Young that I took the opportunity to mark the inlays where they were most efficient, especially to show in the lower right first molar where the inlay had established an inclined plane which would establish a malocclusion, whereas, if it had been reproduced as in the original tooth, no such mouth would have existed. I simply took that liberty because I knew some of the men did not quite see that point.

President—In throwing open this discussion to the house the Chair would like to ask for a full and free discussion from all men, and not particularly from those men who profess to be orthodontists, but from the general practitioners as well.

Dr. Werner—I just want to ask the essayist—perhaps all of you—what makes the cusps? How does the cusp come into existence? How does the groove and how does the sulcus come into existence? Where does the cusp go to, where does the groove go to, what becomes of the sulcus unless it is abnormally deep? I want to just ask these questions. Do not run away with the idea, but consider the utmost importance of the real, of the natural occlusion. The cusps in their natural occlusion for the orthodontist who wants to regulate the malocclusion, are of the utmost importance, but the cusps of the adult and older individual are of no consequence at all. They go with the anatomical changes that go on throughout our anatomical make-up; they are evolved in the long and slow and gradual evolution that fits each animal to its environment. They are maintained or changed, slowly or fast, according to the naturalism in which that animal lives.

The strong point is for the orthodontist to retain his maloccluded, corrected position, but the practical point of it is in the direction of which Dr. Ainsworth spoke, and we must not run

away from the practical side. It is more essential to be practical in our tooth regulation than it is to be ideally beautiful. The majority of people who have tooth trouble come to us, not from the artistic standpoint at all, but they come from the comfortable standpoint, from actual necessity, and when we think of the drift in which we are going, when we come to think of what has been done in the State House to-day, the dental nurse bill turned down; this would have come to the average person among the class of people who do not have any first molar now at 12 or 14 years of age, as a help in the direction of saving that first molar. The first molar is gone; it is obliterated, decayed down to the gum. When we consider that standpoint and the ideal standpoint that our essayist—I thank him for bringing out the ideal standpoint and I stand for it—but there you have got the two extremes, and you have got to regulate and practise from the practical standpoint instead of the ideal.

Again, I ask myself, and I ask others, what makes the cusps in this evolution, in this beautifully long and almost tedious description of the cusps, of the first cusps in the first molar? Five little conical things make these little cusps of the first molar in the human being; first there becomes one, then two, then three, then four, then five, and finally they become confluent and make that beautiful first molar. I certainly want to ask you again what becomes of it in youth? I think it is very essential for maloccluded conditions that the cusps, grooves, and sulci become obliterated. Men will try to produce an inlay when they should only try to do a simple filling in the first stage, and the inlay work only becomes necessary in the later stage, perhaps 15 or 20 years after. If a dentist becomes a good contourist, learns how to make the contour in the grinding surfaces, his inlay work in years after will not be as necessary. I can point to two or three whose work stands for that kind of work. They don't have to do inlays, they do not have to cut down a good part of the occluding surface of that molar because they have learned how to restore the matrix of the proximate surface.

I do not want to belittle what the essayist stands for, but I want to strike a median line. Where is that first molar that we think is the foundation stone of all beauty in adult manhood or womanhood? Where is it? It is disappearing. Many of us who

have practised 30 years will definitely see the change I am speaking of. How many six-year molars did I have to fill before the child was 9 or 10 years old, in my first years of practise? The six-year molar in the average child needs filling before it has come through the gum; it is imperfectly developed now; it has that groove, sulcus, and cusp wholly abnormal.

One more word: I had hoped that the orthodontist would bring out his strong point; I had hoped Dr. Young, Dr. Rogers, and Dr. Baker would bring it out—the retention of the corrected position.

Dr. Lawrence Baker—I think that you will go home and think over more carefully what Dr. Young has said to-night and you will be more impressed with the truth of his paper. He has stated some practical facts. I also think if you get that little book he has suggested, Black's Dental Anatomy, you will follow out more closely his line of work in your fillings. It is a wonderful little book. I did not study that thoroughly until I had been in general practise several years, and after that I found unconsciously I was doing much better work.

Dr. Young has given us a plea to-night, a plea for co-operation. That is a point on which I am very strong, not for the benefit of the orthodontist or the general practitioner, but for the benefit of the patient.

Dr. Wright—I think the general practitioner who is also trying to correct some of the simpler forms of malocclusion will appreciate the importance of this idea when he finds his six-year molars filled with flat surfaces, and before his eyes, after he has dismissed his case with a retainer, begins to see that the teeth are changing from his position, he will mentally pray for some such natural retainer as is provided in nature by these cusps to hold these teeth. And what better retainer can we have than by, perhaps, the overemphasized cusps, which might be produced by the inlay method or some other means of restoration, to act in conjunction with the retainer to hold the six-year molars in place? I think it is a very valuable suggestion, if only viewed from that point alone, to help retain the normal occlusion, and if a man goes after that one tooth in particular with reference to that idea of retention, it will certainly lead him to renewed efforts, in the restoration of the other teeth, to retain the teeth in place. I am very

much obliged for that suggestion, and I think I shall be stimulated to further endeavors for my own protection, as well as for the more perfect functioning of my patients.

President—Dr. Gillett, of New York, has read the paper and sent on a written discussion of the paper, which I will now read:

Dr. H. W. Gillett—It has afforded me great satisfaction to read Dr. Young's paper, having asked the privilege as soon as I received the announcement of this meeting.

I was interested because I have been gradually developing along the same lines, and arriving at the same conclusions with regard to the need for much greater attention on our part to those features of our inlay and crown work which Dr. Young has touched upon. I am heartily in accord with his statements as to the need for, and the possibility of, reproducing the anatomical forms of the occlusal surfaces of the teeth. I have had the same complaint as to inefficiency in tituration of food in cases of extensive restoration of occlusal surfaces.

I am free to admit that it is not long since I considered such inlays as he has criticised to be all that could be expected of us and sufficient to the needs of the case. I am sending by his hand a duplicate of a practical case involving three teeth, which six months ago I considered satisfactory, and which I now consider faulty in the omission of the grooves at the bottom of the sulci and in other respects. It shows an advance over the flat cusplless inlay commonly seen, and provides for cusp interlocking, but falls short of restoring practical efficiency for food tituration. Gradually I have developed a keener appreciation of the value of the cusp relations, in my association with Dr. Ferris, in the consideration of cases of combined orthodontia and prosthodontia. More recently I have come to regard my earlier cases of even-surfaced inlays with almost as keen regret as I do the few cases of first molar extraction, which fell to my lot in the orthodontic efforts of my earlier years of practise.

It is perhaps worth while to say a word in recognition of the reasons why we at first produced only flat inlays. Through all the previous generations of our profession, fillings that should actually reproduce, or even approximate, the anatomical character of occlusal surfaces were impracticable, if not impossible, and at first in our inlay work we had quite enough to do to success-

fully adopt the wonderful new principles brought to us by Dr. Taggart, and to cope with the difficulties of marginal fit and secure anchorage. It was natural that at first we should have been content to attain results similar to our standards in gold foil and amalgam work.

Now that the factors of fit, anchorage, and casting technique are so well in hand, it behooves us to give heed to Dr. Young's plea, and I personally desire to thank him for assistance rendered in solving the problem. I am actively at work to bring my laboratory technique up to the standard he has shown you, and while it is not easy to develop such standards in the hands of our laboratory assistants, it is possible, and I am convinced that to stop short of the mark he has set us will be to fail in our plain duty.

The President—The cases that Dr. Gillett sent on I will now pass around the room.

Is there any further discussion from members of the Academy or guests?

Dr. Morse—I wish to thank the essayist for a very instructive and interesting paper. The general practitioner has very little interest in orthodontia as practised; his experience in it is limited to his instruction in the dental school and a few isolated cases he is obliged to take on of some insistent patients. Nevertheless, it is his duty to his patients, himself, and humanity at large to be interested in more phases of orthodontia, and one of these is normal occlusion.

The essayist has pointed out to us the necessity of making inlays anatomically perfect in order that the painstaking dentist, the orthodontist, may not have his labor of years pulled down in a day. The point that fillings and crowns should be made anatomically perfect cannot be emphasized too strongly. Perhaps the dentist has not been particular enough in his manipulation of the gold and in making crowns. However, there are other ways in which the dentist may destroy the normal occlusion, for instance, making thoughtless extraction. By thoughtless extraction I mean one without a thought of the consequences, of the trouble to follow. For instance, let us suppose a case. It is a theoretical case, but one which I think you will not consider impossible.

The second molars have nearly erupted and the first molar

becomes carious, abscessed, and the abscess going from bad to worse, until the dentist deems it best to remove the tooth. Now, what happens? Into the space left by the first molar the second molar slowly but surely drifts. If the approximating tooth has been removed the patient is dismissed without any further directions, excepting the care of the wound thus made. Dr. Angle, in discussing a similar condition in his last edition, page 94, says:

"The two lower first molars were extracted about the age of 9, with the invariable result. Having lost them, the second and third molars were tipped forward as they erupted without exerting any force and carrying forward the upper three molars and canines."

Now it behooves the dentist to supply the place thus made by extraction with a suitable bridge or other artificial substitute.

President—Is there any other discussion from the house? If there is not, before I call upon Dr. Young to close the discussion as President of the Academy, I wish to tender to him our apologies for our failure in not having a lantern here. It was an oversight and we feel sincerely sorry for it.

Dr. Young—Mr. President, Gentlemen: I am very glad indeed, that there has been some criticism offered here to-night, because it is by being criticised that we improve. However, I am going to feel perfectly free to strike out at some of my critics, and I believe that I can prove that they have misstated facts. I am sorry Dr. Werner has left, because I wanted to say something directly to him in this matter.

While I am speaking, inasmuch as a number of the men are going, I want to pass these two models around. Now, here are two inlays; the one marked A is an inlay that I think you will agree is about like some of those that were in the models that I passed around; the one marked B is an example of what I contend ought to be done and shows that it is practical to do it. Now this inlay marked B is just as it came from the furnace. There are two places, if you examine, that you will find a burnisher has been used on this inlay, but no polishing whatever has been done. I may say that the sprue wire was placed on the inside of this inlay, and as I said in my paper, I have no practical experience in making gold inlays, I did not make this; I had no idea, when I wrote my paper, that it was possible to get such an inlay as this specimen

marked B. But I did feel, and have for years, that the efficiency of the occluding surface of the tooth is ruined by inlays and gold fillings. Before I ever heard or thought of gold inlays I said to a man talking with me about beautiful gold fillings: "I never saw one." He said: "What do you mean?" I said: "I never saw one." He said: "Why, I am told you put in good gold fillings." I said: "I may put in good gold fillings, but I never put in beautiful gold fillings because I have never been able to reproduce the anatomical landmarks of the tooth made by Nature." While these are going around I would like to pass around the two specimens I have, and then I will pass two more.

This one that has the groove reproduced, this bicuspid was polished somewhat, but it shows the possibility of this work.

I will first reply to Dr. Ainsworth: he speaks of sensitive tissue. Now I want you to understand that I am not in any way attempting to champion gold inlays, because that would be absurd; for, as I said, I know nothing about them practically; I never made one, but they are being made, as you will see by these models, and if it is possible to make these extensive restorations, I think it is possible, it is practical, to mimic nature, and that is all I ask. Make those just as near as possible to what the natural condition was. A point comes to my mind in that connection. I would suggest that if a man determines that it is advisable to extend these cavities as we show on these models which are passed around—and, by the way, there was only a year elapsed between the first and second set of the models I pass around—now if the operator determines on making these extensions—I am not going to discuss whether that is advisable in this work or not, I do not know—I would advise that man to make a set of models, take impressions before he does any cutting. He can certainly then get as good a set of models as I have. I want to say that I agree with Dr. Ainsworth that the restoration of the mesio-distal diameter is of more importance than the restoration of the occluding surfaces. It is also of more importance in making the restoration that the mesio-distal diameter should be restored, but the first molars will look abnormal. Now, on the other hand, we must be careful and not attribute every drifting of a tooth to poor dentistry, because I have known cases where the first upper molar erupted mesial to normal in relation to the lower one.

I want to correct Dr. Ainsworth and also Dr. Werner in the question about this work that the cusps in these pronounced conditions are only found in young patients. I admit that the cusps of the teeth do wear away slowly, but where you have good occlusion that means the teeth will not wear away very rapidly, not very much, still they will wear away some; the grooves will not be obliterated in that man's lifetime. We must remember we have a deep groove in the bottom of the sulcus, and that tooth has got to have terrible wear—in fact, I doubt if you can find a case where you have a normal occlusion where the grooves are entirely obliterated. Here are two inlays of a case—this is a bridged tooth—the majority of men would say that is the right kind of inlay to put in that tooth. It is not. That is not the way that tooth was worn. That is made from a tooth out of the mouth and I take an impression of the tooth before cutting the cavity in it and I reproduce it. That is the kind of sulcus in that tooth; when a patient with a tooth like that bites food in there he is able to grind it up. Those grooves are put there for a purpose, so that the mandible in sliding from side to side tears the food up. Now, then, I contend that it is practical to do this work; where inlays are inserted it is practical to reproduce the grooves. Of course, there may be extreme cases, but they are cases where the teeth are exceedingly short, the cusps are exceedingly short, and they should have a very shallow cavity. Now I would say, in such cases as that, possibly it would be better not to put in an inlay at all.

Dr. Werner has spoken about the first molar disappearing. Now I do not know what he meant to imply by that, perhaps that eventually we would find that the human denture would be missing the first molar. I do not know whether he did or not. If he did wish to imply that, I wish to take issue. There is no doubt at all but that the first molar is often allowed to go, but wherever the first molar is lost—the four first molars—you have malocclusion resulting. I will challenge any man to show good, true models, with no malocclusion, after the four first molars have been removed. Furthermore, if they have not been doctored I will challenge any man to show a model where the second molar has drifted forward that has not also drifted lingually, the mesial portion of the tooth has drifted lingually. They always go for-

ward, I do not know why, but they do. I believe that the first molars are the most important teeth in the whole human denture from the standpoint of occlusion, and I believe that occlusion is the foundation on which all dental operations should be done. That is what teeth are for, to occlude and masticate food, and just in proportion as we study normal occlusion and strive to attain normal occlusion in our orthodontia work, in our restoration work, whether it be crowns, bridges, or plates, the better will the patient be pleased with the results.

Now I have just got another thing which I wish to speak about. This is something I accidentally stumbled on in this connection. I will say, as I said in my paper, that I went to several men and asked them where they were making cast gold inlays, especially the impression method, when they had the inlay cemented in, if they would make a second inlay and finish it off just as they would put it in the mouth, and then make a third inlay; and the inlay I passed around I got in this way, and then with the steel engraver that I spoke of, I cut these grooves in it; it was not an easy thing to do, but I did it. That was my first knowledge of this thing. When I found it was rather difficult to get those results I conceived the idea and took a tooth and, cutting a cavity in it, got an impression, made an amalgam die, took it out and put the wax in, and then sent it to be cast. Here are a couple of teeth that have wax in, and these wax reproductions were entirely made with this little stick I have in my hand. I found that with this thing, it was so light that the delicacy of touch with it was very much better than where a heavier steel instrument was used, you could get in there and do the work. The wax inlay will come out. This is a piece of wood that you can buy at art stores for modeling and I find it is sharpened by laying on a glass slide a piece of sandpaper, and planing it down; I think I used the crocus paper to get the delicate fine edge and that is how these inlays have been carved out.

Dr. Ainsworth—I think the Academy should extend a vote of thanks to Dr. Young for the paper which he has given us this evening. It has certainly given us something to think of which must bear fruit; whether we are ready to go to the one extreme or the other, we cannot but benefit by it.

Motion carried.

Adjournment.

SAMUEL T. ELLIOTT, D.M.D.,
Ed. American Academy Dental Science.

**FIRST DISTRICT DENTAL SOCIETY OF THE STATE
OF NEW YORK**

MARCH 4, 1912.

A regular meeting of the First District Society of the State of New York was held at the Academy of Medicine, 17 West Forty-third Street, New York City, on Monday evening, March 4, 1912. The President, Dr. W. W. Walker, occupied the chair, and called the meeting to order. The paper of the evening was entitled "The Technique of Impression Taking and Model Making." (This paper is printed in full at page 164 of the present issue of THE JOURNAL.)

Discussion.

Dr. Ellison Hillyer—When your President said at the beginning of the meeting that Dr. Ottolengui had been preparing this paper for a long time at great expense and with infinite care, I was greatly surprised. I had an idea that this was the outgrowth of a discussion which followed a paper delivered before the Second District Dental Society earlier in the season, when the subject of taking impressions arose; the idea seemed to prevail in the minds of a great many men at that time that the taking of certain impressions in plaster was not necessary at all. That, I think, has been proven to be a fallacy. A man has a perfect right to his opinion in regard to the efficiency of one material over another, but I think the consensus of opinion in the profession is in favor of plaster.

This paper is a further illustration of the fact that orthodontia is doing wonderful things for other branches of dentistry beside itself. The methods that Dr. Kingsley gave to the profession in the early days of orthodontia, followed by his able successor, Dr. Ottolengui, show that the reputation for sculpture work, for which Dr. Kingsley was noted, has descended to Dr. Ottolengui.

There are some questions which I would like to ask the essayist. In taking your upper impression—when you spoke of the washing of certain of the sections before putting them together and laying them upon a card, should that card be of the nature of

blotting paper which Dr. Angle advises? Is it your idea that moisture is required there or the reverse? One idea mentioned by Dr. Ottolengui is entirely divergent from Dr. Angle's; in the taking of the impression by Dr. Angle, after all preliminaries have been attended to, the impression taken out in sections, the parts are separated and laid upon blotting paper. Dr. Angle advises polishing the tray, putting it in the cabinet and not using it again, assembling the impression, piece by piece, the small ones to the larger and the large ones together and uniting them by means of hard wax upon the reverse side.

In regard to spraying, I take it for granted you mean under force of compressed air: under what degree of force?

One very important thing, that I feel was perhaps only just touched upon, was in the last part of the paper, where the essayist said this method could be used in all prosthetic operations. I believe that is the secret that has brought nearly all this audience here to-night. This is a practical, every day subject, and this presentation should convince every one that in all impressions, with the exception possibly of edentulous lower impressions where we desire that some parts should be pressed aside, plaster is indicated, and absolutely so in partial cases. It makes no difference how difficult the case, it can be taken in sections.

If this paper shall have done nothing more than to bring this to the minds of the profession at large, indicating what may be done in partial and full cases, cases other than orthodontia, then I think it will have accomplished a very great good.

Dr. J. Lowe Young—I am very much impressed with the amount of time Dr. Ottolengui has spent on this essay, and the great number of slides he has prepared, to show the technique of this work. It is not necessary for me to dwell on the advisability of using plaster, because I think that is pretty nearly conceded by everybody. I will simply say in a few words how I proceed to take a plaster impression and mention a few points wherein I vary a little from what the essayist has given this evening.

In doing this work for young children I find it is advisable to get them interested. I tell them I am going to use nice, clean, white plaster. First the trays should be accurately selected, and, if necessary, fitted to the mouth. Be sure you have the proper size trays. It is really unfortunate that the manufacturers do not

make trays small enough to use for young children. As far as I know there are none to be had small enough for a child of five years. You must cut them down and reshape them.

Having had trouble in getting French's impression plaster, which is the kind I use for taking impressions, let me caution you to specify the kind that has the blue label on the can. The dental depots like to carry as few kinds of material as possible, and frequently I have had to send back a can of plaster with a white label, although I specified French's impression plaster. But I have not had this trouble since specifying, as stated above.

After the plaster is mixed and put in the tray, as described by the essayist, I make it a practise to smear a little plaster over the labial and buccal sides of the teeth and gums. In doing this the lip is held out of the way by inserting the mouth mirror at the angle of the mouth and the plaster is carried with a suitable bone spatula. I then insert the tray, and have the head thrown well back, so that I may observe when the plaster appears at the back of the tray in the vault of the mouth, and as the back portion of the tray is forced up first, as soon as the plaster appears, the direction of force is changed from the back to the front of the tray, and if done in this way there will be no plaster forced over the soft palate to annoy the patient.

When taking the lower impression the plaster is placed over the teeth and gums, as has been described for the upper, and in both cases the corner of the mouth should be retracted with the mouth mirror in the one hand, while the tray is inserted with the other.

I have used lime water for some years in which to mix plaster, not such as you would buy at a drug store, but made by first boiling water, and then after the water has cooled, add the lime to it. This water is filtered through filter paper, so as to get out all the surplus lime. By the use of this I find that I do not have the trouble in getting bad cans of plaster that a lot of men have spoken to me about. I have not had a can of plaster in five years, which did not suit me, and I can only attribute it to the use of the lime water in mixing the plaster.

The question of the varnish is a matter of choice. I like the shellac varnish, giving two or three, or even four, coats if necessary.

The essayist said that he usually allowed an impression to dry twenty-four hours before doing certain things with it. That depends what time of year you are working the plaster. If you have steam heat in the office, the plaster would dry out very nicely in twenty-four hours. If it is the spring or autumn, and you have no artificial heat and the air is very humid, it would very likely take seventy-two hours for the impression to dry.

I was down at Madison Square Garden, at the Electrical Show, and saw an electric warmer for heating plates. I put one in my laboratory, and it is the finest thing to dry impressions. By putting a few holes in the top of the oven to allow the moisture evaporated to escape, you can dry your impressions in a few hours and they do not become brittle as they do when heated over an ordinary electric stove.

Dr. F. C. Kemple—I expected to hear from Dr. Ottolengui a paper complete in every detail on the technique of impression taking and model making, but in the essay just delivered he has surpassed my anticipations.

Anyone who will devote the same time and care as outlined by the essayist, in taking impressions and making models, will be more than repaid by the satisfactory results obtained. Certainly if he has not been making satisfactory models in the past, he will raise his standard by this technique to such a degree that nothing less than accuracy will satisfy him.

One point I believe was not sufficiently emphasized in the essay of the evening, and that was the importance of accurately fitting the impression tray to the mouth before attempting to take the impression. The tray selected must be reshaped and trimmed to fit the mouth, in order to get a perfect impression without causing decided discomfort to the patient. That is one of the most essential points. The wall of the tray should stand away from the teeth and gums at all points, from one-eighth to one-quarter of an inch. With a tray so fitted, the quantity of plaster required may be so nicely judged that there will be very little, if any, excess plaster.

In retouching the model where there has been an air bubble, or in repairing the model where a corner of a tooth has been fractured, Dr. Ottolengui stated that he allowed the model to dry twenty-four hours before attempting to add the fresh plaster.

He did this in order to have the plaster of the model quickly absorb the moisture from the freshly added plaster. I have taken exactly the reverse course. If a model that I wish to retouch or repair is dry, I moisten the part, I almost saturate the part, and I do this to prevent exactly what Dr. Ottolengui said he wished to produce. If the model is dry it will absorb the water from the freshly added plaster so quickly that there is not sufficient moisture left to supply the water of crystallization, and the added plaster does not set properly, but is left in a crumbly condition.

If the impression tray is accurately fitted I find it is necessary to carry but very little plaster up and over the gum, just enough to exclude the air and prevent bubbles in that part of the impression. The quantity needed for an upper impression should scarcely come to the top of the wall of the tray.

I want to congratulate the essayist on this splendid and timely paper. This subject of impression taking needed just such a treatment as he has given it. I know he spends a great deal of time in getting his models accurate. It is the very foundation of successful work.

Dr. V. H. Jackson—We have heard an elaborate paper. It has been thoroughly discussed. There are only a few points in technique that would be necessary to make it perfect, not but that we might consider it perfect now. If we want to make our patients comfortable in taking impressions, we should first instruct them to breathe through the nose, with the mouth open. If they understand the necessity of that, and follow what we ask them to do, there should be no strangling or especial discomfort, as in breathing through the nose with the mouth open the soft palate always rests on the tongue and separates the mouth from the throat; it would prevent water, saliva or plaster passing to the throat.

In regard to the placing of broken pieces of plaster on blotting paper or cardboard, I use for this purpose Surgeon's white porcelain enamel trays, in measurement $3\frac{1}{2}$ inches x 8 x 1 inch deep, or other sizes. I use one tray for the parts of each impression and arrange the pieces in the tray as they are taken from the mouth. One can handle the tray and lay it aside without feeling that the parts might become disarranged, the tray being narrow, they cannot get very far removed if it should be jarred acci-

dentally. In practise I fit the broken parts of an impression together well, as soon as possible.

As to the composition of shellac varnish for treating an impression, some have little differences of opinion; each operator gets a good result from his method of treatment, but if one needs to hasten his work he should mix an equal part of sandarac varnish with shellac varnish and it will cause the varnish to harden more quickly. Use the varnish thin and it will penetrate deeper, more deeply if the model is dry. The shellac helps to color the impression more than the sandarac, which assists in separating the impression from the model.

I have enjoyed the paper. It is remarkable in its detail, and it has been well discussed.

Dr. Watkins, of Montclair, N. J.—It has given me a great deal of pleasure this evening to listen to this wonderful paper by Dr. Ottolengui. Some of the gentlemen have stated they were surprised at the paper—at the manner in which Dr. Ottolengui presented it and the wonderful slides he exhibited on the screen. That is not a surprise to me at all, for I know Dr. Ottolengui, and know that whenever he undertakes to do anything he goes to the bottom of it and does it thoroughly; consequently, he presented this paper to-night in the manner he did.

I enjoyed the paper immensely. There are a few points which perhaps I do not exactly agree with, but it may be I do not understand them. Dr. Ottolengui did not tell us anything about directing the patients as to how they should breathe while taking the impression. Dr. Jackson referred to that. It is always a good idea to instruct the patient to breathe through the nose. That is one of the first things to tell a patient when you are attempting to take an impression—to breathe through the nose and keep the tongue still. If you impress those two points on the patient it will aid materially.

The idea of throwing the head back in taking an impression I do not agree with. I would throw the head forward, with the idea that any excess would run out of the mouth, and not take a chance of a small particle getting into the throat. Dr. Ottolengui works very carefully with his swabs and brushes, watching the throat carefully, and he can probably protect it; but I should prefer not to take that chance.

There are patients who gag very easily—the moment you place your finger in the mouth. The doctor did not say anything about that. Many times that is very important. I have seen cases where it was impossible to get a tray into the mouth without the patient gagging violently. Over thirty years ago—when I was young in the profession—I conceived the idea of using spirits of camphor in the mouth for a person who was extremely sensitive. I believe I am the originator of that idea. By wiping camphor on the roof of the mouth and on the tongue, and directing the patient to swallow, you can take an impression of any mouth without the patient gagging and with perfect comfort.

In retouching a model I would rather agree with Dr. Kemple. It has always been my practise to do the retouching early, while the impression or model was still green—while it would not absorb the moisture quickly from the new wet plaster; whereas Dr. Ottolengui recommends allowing it to dry thoroughly before retouching.

I wish to thank Dr. Ottolengui for his excellent paper. I have enjoyed it very much.

Dr. Charles Ash—I think we have heard to-night the most important paper we have had this season, and I am only sorry all the persons here could not see Dr. Ottolengui do this work in actual practise, as I have seen him. One of the most valuable things to me was the lesson in plaster impression taking and model making which was given to us by Dr. Ottolengui.

All the gentlemen who discussed the paper, I believe, are orthodontists, and discussed the paper, no doubt, from that standpoint. I do no orthodontia, but I find that the methods Dr. Ottolengui has advocated are equally important in the work we do in prosthodontia.

I overheard a question from one gentleman to another this evening as to where would we be if we followed this method of technique, and got only \$15 for a plate? (Laughter.)

That is a question that must be looked at seriously. Some may think they would be spending more time than the fee would warrant, but if your fee is not increased by using this technique, the value would still be there in the satisfaction you would get in doing your work this way. I am sure, however, your fees would be increased. If you take that care you will make better impres-

sions and better models and turn out better results, and you will have less fussing to do with the piece after it is made, and thereby you will save valuable time in which to be making another piece for patient No. 2.

I do not think there is any part of the work we do that requires more attention than this matter of taking impressions, and even if there was nothing else I had to thank Dr. Ottolengui for than this, I would still be very grateful to him.

Dr. H. L. Wheeler—The people who are here, I am sure, will feel amply repaid for coming to-night, and those who are not here have certainly missed a very valuable evening. If this taking of impressions in plaster is such a necessity in orthodontia, how much greater a necessity is it for prosthetic work, especially for partial dentures, bridges, etc., for it is the only way you can get accuracy. In regard to what Dr. Ash said, a man may feel that it is economy to take an impression with modeling compound, but the economy does not show when the work has to be done over because it does not fit. If one would follow the instructions of Dr. Ottolengui carefully and intelligently, he will have very few pieces to reconstruct.

Dr. Gillett—In behalf of the Executive Committee I desire to thank Dr. Ottolengui. Our thanks are due him not only because he has prepared for us a remarkable paper and taken pains to present it in the best possible manner, but because he has blazed a trail which we trust future executive committees will develop into a broad highway. We hope it may become the custom for this Society to receive from its own members papers that shall deserve to rank with this one in practical value and completeness of preparation and presentation. We know our own members have talent, and we desire to hear from them more often.

Dr. Ash moved a vote of thanks to the essayist, which was unanimously carried.

Dr. Ottolengui—I want to thank all the gentlemen who took part in the discussion for the nice things they have said.

Dr. Hillyer asked me to make a little clearer what I mean by washing the impression when I take it from the mouth. I wash those particles, because, if the impression is to be put back in the impression tray, the tiniest particle of plaster which adheres to

the outside, or in the joints, will interfere with the proper union, and I find that nothing but running water takes it off. That brings me to the question about blotting paper; if I take the impression out of the mouth and carry it at once to a faucet and let water run on it, there is no advantage in using blotting paper. I use cards that I can buy for \$2.50 a thousand. Afterwards, to swab out the excess of moisture, I use bibulous paper.

I want to thank Dr. Young for his suggestion. I have dried out an impression sometimes by placing the tray on top of a card, placing that on the heater in the office, when there has been any necessity for hurry.

Another advantage about assembling the parts immediately in the tray and so doing just the opposite to what Dr. Angle advises is this—if you use the tray you can assemble the parts at once while it is wet. You manifestly cannot put them together promptly and expect wax to adhere to the plaster. In addition to that, if you look in Dr. Angle's book you will see he tells you that the impressions come out in four pieces; and I have also told you that; but sometimes they come out in fourteen pieces. The tray is a great help in such cases.

What Dr. Angle was aiming at, I think, was that nothing but a perfectly bright, clean tray should be put into a patient's mouth. That is perfectly true, but it is not necessary to save the tray to that extent. It would be if you had but one tray of each size, but if you buy three or four dozen, and have a plentiful supply and have them renickeled once a year for about \$2.00 for the lot, you start out each season with an array of beautiful, clean trays. As Dr. Kemple says, they keep getting nicer and better. Those trays of mine have been renickeled and reshaped so many times that I have a set now that I could not buy.

Now about modeling compound. I made a point in my paper that plaster should be used where there are teeth in the mouth. When we deal with edentulous jaws, that is another matter; and I have not seen any better technique than was described in a paper written some years ago by Dr. Watkins.

Dr. Hillyer, President of the New York State Dental Society—I intend to say just a word or two simply because it has become a custom. I do not know how long ago the custom originated for

the president of the State Society to visit the various district societies and report at the annual meeting as to the general conditions throughout the State. Clinics in this part of the State are not perhaps encouraged as much as in other parts, simply because the profession here sees so much all the time. In other parts of the State they are very much appreciated, consequently an appeal has been made to send as many clinicians as possible to Albany. It is a very easy matter to secure them here, because there are so many who are capable. I understand Dr. Kemple and Dr. Heckard have asked for some volunteers, and I hope you will accede to their request as quickly as possible.

It is a great pleasure to see that the matter of reorganization in this district has taken place, and that you have such a Society as you have. The question of reorganization of the State Society will come up at no far distant date. It is questionable how this can best be accomplished, but that will be broached at the coming State Society meeting, at which time it is expected this Society shall have its full share of—shall I say responsibility?—as well as the fruits of whatever reorganization may be made. I consider that the New York State Society has one of the best organizations in the country. As far as membership is concerned, that is a different proposition; I intend to offer some plan at the coming Albany meeting, and I ask for as large an attendance as possible at that meeting, which I contend is merely the annual gathering of all the district societies.

Adjournment.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK

SECTION ON STOMATOLOGY AND RESEARCH.

Special Meeting Held February 19, 1912.

DR. J. MORGAN HOWE, CHAIRMAN.

(Discussion of Dr. Gies' paper, "A Plea for Deeper Investigation of Dental Diseases," which is printed in full at page 199 of this issue of THE JOURNAL.)

Dr. J. Morgan Howe—We could not study this subject under more favorable circumstances than we are now doing. When

this problem was first presented to Professor Gies he said he was willing to undertake the work without any remuneration whatever, or any expectation of reward, except the gratification of his scientific interest, and the hope that it would benefit the public. When we have progressed a little further so as to be able to present the matter better, the public may well be addressed on the subject and be asked to take an interest in it. It may take a long time to learn all we need to know in order to prevent decay, but we should not on that account have the least idea of giving up the search.

As to dentists being put out of business, it appears to me that success in this research will raise the dentist's services to the higher level merely of prescribing preventive measures for individuals and for groups. Some dentists even now spend considerable time advocating oral hygiene as a preventive measure, but how valuable the service of a dental adviser will be when his knowledge is definite and his measures effectual. When we consider what has been done in the prevention of some diseases, such as malaria, diphtheria, yellow fever, typhoid fever, tetanus, rabies, tuberculosis, we see how preventive measures that have been of great value are not at all lessening the need of professional services, but are extending them to wider circles of people. When we come to consider, as we will some day, what measures can be taken to prevent decay of the teeth, the services a dentist can render will be pushed up to a higher plane. He will oftener be consulted to prescribe measures for prevention than be asked to make repairs on old wrecks.

Dr. Henry W. Gillett—I desire to express my appreciation of the earnestness with which Professor Gies has enlisted in this work. I am filled afresh with enthusiasm each time he renders us a report of progress.

Before referring to the main point I have in mind, I desire to say a word in regard to the possibility of such investigations as he is making, lessening the need for dental services. I can conceive of no such result being possible. They are, in my opinion, much more likely to increase the need for dental service and make the importance and value of such service apparent to a larger number of people, thus increasing the demands upon us. In any event, it must be evident, upon a little consideration, that at present we are

but scratching the surface possibilities of dental practise, and that we are leaving undone many things which would increase our helpfulness to our clientele.

I desire to refer to Professor Gies' remark concerning our possible disappointment at results. There should be no feeling of disappointment possible in our minds if his investigations bring us no positive solution of the problem he has in hand. We have much published material scattered through our literature bearing upon the cause of caries, but it is in such form as to be of slight value in arriving at conclusions. Even if his present efforts should bring no result other than the collating of this material and a sifting out of the scientific and well founded from the pseudo-scientific and incorrect, and the recording of the present status of the sum of our real knowledge, it will be a result well worth while.

Such a service can be rendered us, and the public, in no other way than by placing the work in the hands of just such trained scientific observers as Professor Gies and his assistants.

The recording of a negative result in any particular line of investigation has a definite value in the solution of the main problem, in that it makes unnecessary further work in that line, unless an error can be detected. I desire to urge upon you the importance of co-operating with him in collecting saliva. I have a supply of bottles fitted for insertion in the saliva ejector tubes, and will be pleased to supply any of you who desire to make use of them.

Professor Gies—Dr. Howe and Dr. Gillett have given us very efficient and faithful co-operation from the beginning of our work. I wish that many more dentists were as willing, as they have been, to provide valuable supplies.

We shall be pleased to give advice, regarding the collection, preservation and transportation of saliva, to any who may wish to help. At present we need an abundant supply of saliva. We are working on salivary mucin and, since the proportion of mucin in saliva is very small, very large volumes of the secretion are necessary for the isolation of the minimal quantities of mucin required for the essential observations. We are doing most of this work, at present, on mucin obtained from salivary glands of oxen, but naturally we wish to compare all our facts on this basis with

data pertaining to the human product. Our task in this relation of the work, as in many others, is the institution of strictly normal and typical relationships. I shall be especially glad to receive advice, now and at any time hereafter, regarding the maintenance of experimental conditions outside the mouth, which will be practically identical, so far as teeth are concerned, with the conditions of the normal oral environment.

Dr. Herman E. S. Chayes—I want to tell Dr. Gies how much I appreciate his broad discourse on research and investigation.

The spirit of absolute devotion he speaks of is very conspicuous by its absence in our profession.

We are, as a whole, a very empirical lot, first breaking through the stifling, strangling crust of an ignorant fettering past which holds us bound to a lot of useless information and misleading traditions.

As we reach the light of day by the path of reason we begin to realize just how woefully ignorant we are, and when we finally come to a complete realization of that fact, we will be fit to attempt our own improvement.

No half-way attempt will do and no building up of so-called previous knowledge.

We have no correct previous knowledge upon the subject the doctor brought up for investigation, and it would surely lead us further astray to attempt to blend what we were supposed to know of it with what we shall really learn.

We cannot hope for a perfectly scientific conclusion unless we begin with a correct premise.

I know that it is a largely accepted belief that all enamels are of the same chemical make-up, and that once formed it is subject to no structural change, but I hold that such belief is unwarranted in the light of common reason and logic.

Why should enamel, a part of the ever changing human body, be immune from changes which affect say, the nails, the skin, the hair, etc.? Is it because the enamel contains so little organic matter or living matter that the usual physiological and pathological changes cannot affect its chemiographic substance? If so, it would seem that Nature has erred very broadly in constructing the human or animal being, and perhaps it would have been a wise provision to have less organic and an abundance more of in-

organic material in our chemical make-up, and so perhaps we might have been more immune to pathological influences.

On the other hand, it is reasonable to suppose, and perfectly permissible to assume, that during certain periods of stress the fully formed enamel might undergo certain destructive changes, chemicoplastically which would make it an easy prey to pathological influences.

It certainly does seem more sane for the purpose of unbiased investigation to divest ourselves from the mass of pseudo-science which fills volumes of our text-books and which, in truth, has been and is responsible for the lack of real scientific knowledge upon this most important subject.

Dr. Gies asks how conditions existing in the mouth can best be reproduced outside the oral cavity, he asks this relative to the experiment going on with the substance called mucin.

It strikes me that it is not necessary to go outside the oral cavity in order to either deny or affirm the causative part played by mucin in the decay of the teeth.

Let him take any patient who is compelled to wear an artificial partial denture and let him substitute for some of the porcelain teeth attached to this fixture two natural molar crowns, one on each side; let one of the crowns be perfectly free from any decay, and let it be kept highly polished.

The other crown shall have a cavity caused by decay or mechanical means. Thus we shall have two natural tooth crowns placed in a medium supposed to be conducive to dental decay, and yet the two crowns will be outside and away from any systemic influence of the same patient—since they have no periodontal attachment—hence no blood or lymph supply.

If these teeth decay, it will be definitely settled that the substance attacking the tooth structure is carried in the saliva and the work can then be taken up along the lines of elimination—that is, each suspected causative element found in the saliva can be taken up and put through the third degree in research until we arrive at the proper solution of our problem.

I want to thank Dr. Gies again for his masterful discourse, and assure him of my co-operation in any capacity he may desire to command my humble efforts.

Professor Gies—I greatly appreciate the earnest approval

which Dr. Chayes has just indicated. I thank him for his suggestions relating to experimental procedure. I am glad to have his endorsement of my belief that enamel is subject to natural structural changes, which affect its resistance to destructive influences.

Let me digress for a minute, again to urge attention to my suggestion, as stated two years ago, that dilute solutions of various natural organic acids (*e.g.*, diluted vinegar and diluted fruit juices), may be useful agents for cleansing the teeth, both by their disorganizing effect on mucin plaques and by their stimulating influence on salivary flow, with consequent natural flushing of the oral and dental surfaces. The current general employment of alkaline or basic dentifrices does not appear to me to be wholly warranted. I know this suggestion is a radical one, but all I propose is that the matter be given a trial. My suggestion can be tested in the conviction that harm will not result to any one before the value of the treatment is ascertained. The suggestion can be definitely and emphatically rejected if the deductions on which it depends are unfounded.

Dr. J. Morgan Howe—I have several patients who have cleaned their teeth with a solution of vinegar for six months and more, and I have never seen their teeth kept so clean, or found them so free from decay.

Adjournment.

THE MASSACHUSETTS DENTAL SOCIETY

May 2, 1912.

DISCUSSION OF PRESIDENT'S ADDRESS.¹

Dr. C. Wesley Hale—Before entering upon the discussion of this address it will give me greater freedom and a clearer conscience if I say that I am fully aware that there are many present to whom you might much more profitably give your attention, but since from my earliest instruction in dentistry I have acquired the habit of doing as directed by my esteemed and honored former professor, Dr. Smith, I have complied with his request, as I shall endeavor to do with his instructions, to discuss the address “faithfully, fearlessly, and frankly.” I think it is perfectly clear in the

¹ Dr. Smith's paper is printed in full at page 159 of this issue of THE JOURNAL.

minds of all why we have been pleased to honor Dr. Smith with the presidency of our Society. Very few actively interest themselves in effective organization work, and fewer still are able to succeed as has Dr. Smith in his chosen field. The importance of the manly, wholesome influence of a man in his position cannot be overestimated. "As the twig is bent, the tree is inclined," and as societies represent but the aggregate of our individual ideals, the importance of our early professional training is evident. I heartily concur in all that our president has said regarding the Independent Dental Journal. I do not think he could have chosen a better example to illustrate his point, and he has done it in a large-minded way, giving credit where credit is due, but aiming directly at the mark. I never take up THE JOURNAL without thinking with pride, "This is *our* independent JOURNAL," and the profession *grows* in my estimation. The public will not place a higher estimate upon our professionalism than we place upon ourselves. We cannot act like professional men if we know we are unworthy. I quote: "So each man tries to flee that secret foe which is himself; but be he swift or slow, that self, forever punctual at his heels never for one short hour will let him go." Let us hope that the records of independent dental journalism will show that Massachusetts stood in her time-honored place with all the support she could conscientiously give.

The world-wide crusade for mouth cleanliness to which reference has been made is a very hopeful sign. The enlightenment of the public upon this important subject by the Massachusetts Hygiene Council, and such other agencies as have contributed to this end, is something for which public and profession alike have reason to be grateful. And I believe this Society should take such steps as may be necessary for continuing and sustaining this educational work.

To what extent and in what form the public may look to us to do what has been termed "our full duty" in caring for the teeth of the children in the public schools I am not prepared to say. It is a subject for serious consideration.

If I understand him correctly, I do not concur with our president in his interpretation of the action of such dentists in our State as do not at present favor the passage of the Dental Nurse Bill as presented to the Legislature a short time ago. There is, to my

mind, chance for some honest difference of opinion as to the wisdom of the enactment of such legislation.

I did not then believe, nor am I yet convinced, that the time is ripe for the passage of a bill like the one before mentioned. I do not consider myself expert upon the subject, however, and I think we should strive always to maintain an open mind, ready to receive and consider anything which may be in the interest of truth and progress, but while we have a conviction on either side of the question let us stand up and be counted and be shamed by no one.

I grant there are some good points about this bill, and I believe the time is not far distant when something along this line will be worked out and in such form as to become a law in this State. It would not seem that we could be overeducated upon this or any other subject connected with our profession, and I will be glad if suitable steps are taken by which we may become more fully informed as to the true value of the dental nurse. The sentiment in favor of establishing a Post-Graduate School in Dentistry, under the auspices of our State Society, has not previously come to my attention. I cannot contribute any information upon the subject, but do not think I would be in favor of such action at the present time.

If a committee of three for the purpose of increasing the membership in the State Society can work in harmony with the boards of censors of the different districts I can see no objection to it, and I do favor the encouragement of research work. A committee to investigate discrepancies in the constitution and by-laws can surely be of service.

I congratulate the president and other officers upon the successful showing for the year and thank you for your attention.

Dr. Carl R. Lindstrom—We have listened to the president's address with a good deal of interest. He has treated his subject in his usual happy and logical manner. The recommendations, coming as they do from so distinguished a colleague, carry with them a weight which forces us to stop and consider. He has strongly advocated the professional journal, not because the so-called trade journal does not serve a legitimate use, but because the former serves a higher and therefore a better use by printing in an unbiased way the subject matter—*i.e.*, allowing neither

"vested interests" so-called, nor the advertising columns, to control the publication. The Massachusetts Dental Society, having avowed its support of the professional journal, cannot afford to and should not take any step backward in this matter, but should continue to stand for the highest and best things in the dental profession.

The president also refers appreciatingly to the work of the Massachusetts Oral Hygiene Council, which was, I believe, the first body of its kind in America, and which has proved to be the forerunner of similar bodies all over the country. Some of these councils have been able, perhaps, to exert even a *wider* influence, because they have in some instances adopted *broader* policies. I certainly approve of our organization being represented by membership in the council, and also approve of our doing our share towards its financial support. The work of the council in preaching the gospel of "Dental Sanitation" has done more to create a demand for a more efficient service in the line of preventive work, than the dentist, unaided by the dental nurse, can ever hope to render the public. I believe that the Dental Nurse Bill would have passed the Legislature, had it not been so strenuously opposed by the Board of Registration in Dentistry. That the very body which exists for the safeguarding of the public should be able to take such a narrow and unsympathetic view of the altruistic purpose of those who were advocating the bill is inconceivable, to say the least. This very fact, however, is one proof of the need of continued effort along the line of the education of many in our ranks. The dental nurse is *coming* in the near future, whether her coming is opposed or supported by the dentists themselves, simply because the *public* is going to demand her services.

Two of the most efficient means for the accomplishment of a more widespread education of the members of the profession along these new lines are the dental journal and the public press columns. I emphatically agree with our president that the fight for such legislation as is above referred to should be continued till the passage of the Dental Nurse Bill is an accomplished fact. I certainly advocate the increasing of the membership of this Society that money may be forthcoming for the establishment of scholarships or the furtherance of research work. But I also think it wise to examine into the question of the need of and the demand

for such post-graduate work, under the auspices of this Society, and for this purpose let the same committee as above take up the matter and report upon it at a future meeting.

Regarding the discrepancies in the constitution and by-laws referred to by our president, I support his recommendation with reference to the matter. The president calls your attention to the same matter brought up a year ago, viz., that the president, the executive committee and the secretary of this Society be notified always of all meetings of the various district societies. It seems to me that courtesy alone demands this, to say nothing of the closer understanding thereby established of the various interests and activities of the different district societies.

Dr. Alfred P. Rogers—The suggestions which are contained in the president's address should be carefully weighed by the Society, for we are in a position, more truly than in many societies, to carry out these suggestions to lift professional spirit and professional accomplishment at least a little higher.

If the profession wishes to support an independent journal, then it seems to me that that journal should be better than any that is in existence to-day, and that we should place ourselves in a position to pay well for editorial services as well as to secure the best form of printers' and engravers' art. The American Orthodontist is a good example of what may be accomplished in the way of a fine journal supported by a comparatively small body of men. We should lend most hearty support to this matter of publication, for it will surely be our fault if the journal remains the least bit inefficient. If to attain greater efficiency, the journal is in need of further financial support, we should not hesitate to give it.

The president has spoken of the matter of increased membership in our Society. This is a vital matter, and I think it would be most wise to appoint an efficient committee to work in this direction.

What has been said regarding the Oral Hygiene Council has been encouraging. In some instances there seems to have been a falling off of service, which is to be regretted.

President E. H. Smith, closing—I knew that Dr. Hale was opposed to the Dental Nurse Bill. That was the reason why I appointed him to discuss the paper. There was an opportunity for free discussion. The dental nurse matter is a campaign of education, which I hope will go on in a free and unbiased manner.

THE JOURNAL OF THE ALLIED SOCIETIES

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EDITORIAL DEPARTMENT

THE WEIGHT OF EVIDENCE

In this age of efficiency—this time of advance along the frontier of the marvelous—it is strange to note certain blind spots in the human mind which check perpetually our zeal and remand us to the ranks of finite beings. We take much pride, and justly so, in our scientific attainments; but while, at infrequent intervals great steps are taken quickly by men of clear vision, it also is true that men at large are remarkably slow in following the path of progress. An explosion of joy marks the discovery of a new scent; whereupon all hands sit down, exchange congratulations, determine who first saw the wonder, conjecture upon the

likelihood of its leading somewhere, and then tardily, and with much stumbling, resume the journey.

It is true that all great advances in human affairs are precursed by this laborious waste of energy. Our clumsy machinery loses motion at every cog; yet the dreams of former mariners showed the way for Columbus; Ampère and Faraday cleared the path for Morse; hundreds of quiet workers made possible the sublime achievement of Marconi.

While realizing this fact, however, we should remember that these rare men brought order out of chaos by their gift of seeing truly. They were able to sift the real from the false—the vital from the non-vital facts in a mass of accumulated knowledge. Their achievements were due to the rare ability to examine evidence.

In his admirable address¹ before the Section on Research of the First District Dental Society of New York, Professor W. J. Gies outlines clearly the cast of mind which carries the few great men to results of the first order. This scientific spirit is the force which arranges the incongruous and useless labors of less gifted men and electrifies the dark mass into a crystal of light.

We who fill the more modest stations in the progress of science must conserve our abilities by a strict economy. Our efforts may serve only the purpose of some alchemist yet unborn, but, such as they are, they should be thrown in one direction—toward the ultimate truth

¹ See page 199.

underlying any series of facts. We have little time to inquire who first saw the "likely lead," and no use whatever for conjectures based merely upon human authority, how venerable soever.

Tradition and empirical revelation are stubborn obstacles and slow to deal with. The runaway negro Jim, Huckleberry Finn's companion and oracle, took the classic stand which has ever cheered good men in holding to well-worn paths. The progressive Huckleberry, in a rash moment, questions certain of the less authenticated phases of witchcraft. "Doan talk to me 'bout witches," replies the seer; "I reckon I knows what I *knows*."

Our dental conventions abound in discussions that lead more or less wide of the mark. This criticism is confined, for the moment, to dental organizations, because it is desired to emphasize the fact that we share eminently this vice with other bodies of men. Much time is consumed in examining elaborate theories or conclusions in dental pathology—let us say—based upon incomplete observations by men who have but a slight measure of the technical equipment needed for the work. These views are discussed at length by others having still less knowledge of technical procedures, or who are strongly biased by convictions which have carried them through years of successful practise. The dogmatism of experience is the most dangerous clog to scientific progress. In the light of experience, who would have fathered the steamboat or the telephone?

It is not urged that we all must be perfect at once; if we were, discussion would not be needed. It is urged that our special problems be placed in the hands of experts, who will co-operate with practising dentists in seeking results, the attainment of which is beyond the unaided ability of either party. These results should be checked and counterchecked by the best methods known, regardless of anything like personal interest in the outcome. The modern investigator is an inveterate sceptic and his own severest critic. In the discussion of these problems a standardized nomenclature should be used by men specially prepared to discuss, in order that the record may be clear to the thousands of readers who depend upon the printed report. The danger of misapprehension of the speaker's meaning should be reduced to a minimum. His statements should be made so clearly that his readers not only may understand, but that they cannot misunderstand.

The true man of science is an intellectual Arab, who wanders forever in sterile sands, abiding where the night finds him, and ready in the morning to search for the hidden spring, which he may never find. He toils through all unlikely places. To him nothing is unimportant, nor is anything above suspicion: he knows well the treacherous mirage. Still, in light marching trim, he holds his way, not doubting of the precious reward which Allah shall provide.

PROGRESS ALONG THE LINE

With the retreat of Winter and the coming of Spring (we have been advised by poets and other persons of authority), mankind is stirred to thoughts that have to do with vital matters in many fields. Aside from aspirations of a sentimental character, the mind leaps to visions of progress in practical things and affairs. The dental profession is emerging from its winter of discontent in regard to its large associations, and the genial influence is being felt of a broader conception of what is needed in our professional growth. The day has gone by in which the most useful form of State or National dental society consists in a close organization of men who have been advanced through the narrow path of delegateship. Their advancement on that plan implies not necessarily that such men are representative dentists, but that they are good society workers. Thus a man of very mediocre professional attainments may rise to the presidency of our foremost association. He may have little or no scientific abilities, and yet stand at the head of a body of scientific men.

The so-called "Illinois plan" is gaining ground everywhere. The theory of that plan is, simply, that if a man is found reputable and worthy of membership in his local society, he shall at once be fit for membership "higher up"—in his State and in the National Association. A little attention will show the real worth of this test. Who shall know if a man

be an honest and capable practitioner? His own associates, to be sure, who make up his local society. Can the officers of more general organizations know him so well? In other words, this man, having gained admittance to his local society, has met the requirements of his most capable judges. Granting then that he is a fit associate, why delay the advantages that should come to him and to all concerned by his prompt advancement to membership in the larger societies?

The "reward of merit" system in the past has rewarded the "good boys" and the deliberate politicians. This argues not against proper political machinery, which is necessary, but against such machinery, the output of which is the gratification of selfish ends among a few men. Commonly the men of real attainments in the progress of dental science are not advanced upon the old plan, because their work is scientific, and not political.

We want large associations of active men. We want the organized work of thousands of men, as compared with the labors of hundreds, now in our State societies. We need State organizations which elevate the professional lives of the individuals and which stand as powers in enforcing our dental laws and in furthering measures affecting the dental welfare of the public. Above all, we need a compacted and efficient National Association, of not less than ten thousand members. Such organizations can be brought into being only by opening the membership lists of all reputable local societies.

We spoke of the genial Springtime among our State societies. That season seems at hand, for not only are those bodies reorganizing to meet the new needs, but the National Association is preparing to take its place as the parent dental society in America. It is encouraging to note each item of advance. At the recent meeting of the New York State Dental Society were adopted the far-sighted recommendations of President Hillyer to open its membership to all members of the nine district societies. A further step was taken in voting that the New York State Society apply for Constituent Membership in the National, under the plan of reorganization in that body. We are informed that the State organizations of Arizona, Maryland, Michigan, Ohio, District of Columbia, Connecticut, Rhode Island, Vermont and Massachusetts have taken similar steps, and in all likelihood others will follow soon. So that at last we are having real growth, where for many years rested blight and stagnation.

BOOK REVIEWS

BY C. FRANKLIN MACDONALD, D.M.D.

LOCAL ANESTHESIA IN DENTISTRY. With special reference to the Mucous and Conductive Methods. A Guide for Dentists, Surgeons, and Students. By Professor Dr. Guido Fischer, Director of the Royal Dental Institute of the University of Marburg. Translated by Dr. Richard H. Riethmüller, of the Dental Department of the Medico-Chirurgical College, Philadelphia. Large octavo, 202 pages, with 105 figures (mostly colored). Cloth, \$4.00, net. Lea & Febiger, Publishers, Philadelphia and New York, 1912.

This English translation of Prof. Guido Fischer's work by Dr. Riethmüller comes at a most propitious moment when all are so keenly interested in methods for carrying on painless dental operations, and this book presents the most modern and successful methods yet demonstrated along the lines of local injections.

The book consists of three sections, the first entering into a brief historical review of local anesthesia, a comparison of the various drugs so used, and, after selecting as best adapted for this purpose Novocain-Suprarenin, discusses this combination and its actions with the necessary elaboration and preliminary preparations for use.

Section II., under "Indications for Local Anesthesia," enters into more detail as to the various sequelæ which may follow, the contra-indications and some methods of general systemic treatment for use in correlation with the injection methods. Dr. Fischer mentions some remedies which, perhaps, are not commonly known or used by the dental profession here, and likewise gives more uses for novocain as a local healing and sedative agent than is generally credited to it. His treatment of vital pulp stumps and root treatments in case of pulpitis—on the whole quite vaguely discussed—may be open to controversy. Throughout these two sections the author has a tendency to repeat, probably due to his endeavor to impress certain points upon the reader.

The third part consists of the technique of local injections. It begins with a rather minute study of the osseous parts, followed by a description of the nerve distributions with their relations

to each other and the surrounding structures; the section being completed by a careful and clear enunciation of the methods to be pursued in the anesthetization of each individual tooth. The last pages are devoted to a chart condensing and tabulating the previous methods, a chart for quick and practical reference.

It is to be noted, however, that nowhere in the book is mention made of intra-alveolar injection, a method quite extensively used in Europe and offering in certain cases some advantages over Dr. Fischer's methods.

The illustrations, many colored, are some of the finest which have appeared in a dental work; in fact, the great value of this book lies in these cuts which so well elucidate the subject matter of the text.

To those who wish to become proficient in local anesthesia for dental operations this book will be of much value and interest and of great assistance in the practical application of local injections, and, further, all should be thankful to Dr. Riethmüller for his painstaking translation of this scientific work.

MANUAL OF CHEMISTRY, by W. Simon, Ph.D., M.D., and Daniel Base, Ph.D. Published by Lea & Febiger, New York. Price, \$3.00.

The ninth edition of a popular text for beginners on General, Organic, and Physiological Chemistry; the sub-title reading "Specially Adapted for Students of Medicine, Pharmacy, and Dentistry."

From the standpoint of General Chemistry the inorganic, qualitative, and quantitative analysis is excellent and quite in sufficient detail for students. Likewise the section upon Organic, many compounds in Pharmacy and Materia Medica being introduced and discussed from the standpoint of Chemistry and practical use.

Much of the chemistry of special interest to dentists is rather neglected, there being practically nothing upon the subject of metallurgy as pertaining to dental compounds. Nothing is given of the composition and proportions of a dental alloy or fusible alloy or those peculiar properties of the metals involved. Cements, under Zinc Oxyphosphate, receive an incomplete discus-

sion and the more modern cements, especially the artificial enamels, are not mentioned.

The section devoted to Physiological Chemistry is quite sufficient and generally up-to-date. Saliva, however, as is usual, receives a very general treatment, and is not presented in the light of the most recent investigation. Urine is briefly considered—enough for the needs of the laboratory.

Throughout the book the authors have prepared, at the end of each chapter, questions based upon the preceding subject matter; this is a most happy and valuable means for reviewing.

On the whole, however, this textbook is very good for general reading and study for beginners, and can well be recommended, but is not particularly adapted as a book for reference.

THE MECHANICAL SIDE OF ANATOMICAL ARTICULATION, by George Wood Clapp, D.D.S. Published by the Press of the Dental Digest, 1910.

Anatomical articulation, with its complex theories and rather elaborate methods for its application, has rather discouraged the average dentist from making use of its principles.

Dr. Clapp, in this book of ninety pages, has tried to overcome some of these difficulties by eliminating all the theories and confining himself entirely to a way for actually producing a practical anatomical articulation.

He has written about a matter which could best be explained by an actual demonstration, and considering this great handicap, has succeeded quite well.

There are some chapters devoted to teeth and their selection, containing useful hints and a method of tooth selection by measurements which seems worthy of adoption.

The illustrations are good and help the text, which is generally clear and easily understood.

Dr. Clapp's treatise has helped to simplify this subject from a practical standpoint, and should be of considerable value to a beginner in this line, but the novice must expect to give time to study and experimenting before becoming proficient in anatomical articulation.

MODERN DENTAL MATERIA MEDICA, PHARMACOLOGY AND THERAPEUTICS. Third edition, by J. P. Buckley, Ph.G., D.D.S. Published by P. Blakiston, Son & Co., Philadelphia, 1911. Price, \$2.50.

Dr. Buckley, who has in the past been prominent in dental literature with his short essays upon dental remedies, has now presented to the profession a textbook embodying what he considers as sufficient for the dentist to know of *Materia Medica* and *Therapeutics*.

The author has evidently striven to present his subject matter in as concise and yet as complete a form as was practicable, as can be seen from the fact that the book consists of only 388 pages.

The book is divided into two main divisions—the first portion consisting of the preliminary definitions under which the drugs are classified, and then follows the section upon the drugs proper, in the same order. The drugs are discussed concisely, clearly and to the point, much of the theories and historical data so often found being omitted. He has included with each drug, in tabular form and separate from the rest, the important official preparations with their dosage in grains and grams. The subject matter under each remedy is likewise successfully subdivided, each subdivision being made prominent by heavy type headings, thus making a logical and easily comprehended discussion, which admits of quick reference to a particular phase of the subject. In general, there is sufficient detail, although the section upon general anæsthetics might well be elaborated upon. The author has made a good selection of drugs to discuss and fairly covered the ground from a dental standpoint. Serum-therapy, however, a rather important subject, has not been mentioned.

Upon prescription writing, which completes the first section, there is generally sufficient detail; the author might possibly have improved this section by following his general plan and tabulated certain things such as the Latin names and signs and peculiar endings, and included a table upon solubility and posology.

The section upon practical dental therapeutics is written entirely in the first person, but this is perhaps permissible, as the therapeutics are said to be drawn almost entirely from the author's own successful experience.

Dr. Buckley writes on page 297: "It is better to have a practical knowledge of a few remedies than a superficial knowledge of many." An excellent motto, which he has tried to put into execution, and he has in this section outlined good conservative treatments, even though not exhausting the subject. Prescriptions are few, but sufficient for general use.

As an exhaustive treatise upon the subject of Dental Materia Medica and Therapeutics from all aspects, this book may not fulfil the conditions, but as a trustworthy, concise, up-to-date, and practical Materia Medica for the student or busy practitioner who wishes to get at the fundamental facts quickly and easily, it is to be heartily recommended.

OBITUARY**MEMORIAL TO DR. SAFFORD GOODWIN PERRY**

At the last meeting of the American Academy of Dental Science, Boston, the following resolutions were unanimously adopted:

"Whereas, The American Academy of Dental Science has learned with deep regret of the sudden death of Dr. Safford Goodwin Perry, one of its esteemed associate members; and,

"Whereas, it is fitting that we should spread upon our records a testimonial of our high appreciation of his ability, untiring zeal, and steadfast consecration to the profession he loved so well; therefore, be it

"Resolved, That in his death this Society has lost one of its most honored members, and the profession at large a man of rare ability and attainments, whose charming personality has endeared him to all who knew him; a man of sterling integrity, who could not or would not say an unkind word of any one. To know him well was to love him well.

"That, with a copy of this expression of our appreciation, esteem and affection, we tender to his widow and family our sincere sympathy.

"GEORGE C. AINSWORTH,

"ROBERT R. ANDREWS,

"EDWARD C. BRIGGS,

"Committee."

SAMUEL EDWARD DAVIS

DIED, at St. Luke's Hospital, New York City, on Friday, April 5, 1912, in his seventy-second year, SAMUEL EDWARD DAVIS.

Dr. Davis was born at Hardwick, Vt., October 28, 1841. He was educated at Danville, Vt., and in 1859 became associated with Dr. Forbush, of Montpelier, in the practise of dentistry. On September 8, 1862, he enrolled as a private in Company B, Fifteenth Regiment Vermont Volunteers, in the service of the United States in the War of the Rebellion, and was honorably discharged

at Brattleboro, Vt., August 5, 1863. In 1866 he entered as a student the office of E. J. Dunning, of 11 Waverley Place, New York City, with whom he remained associated for about seven years. Subsequently, Dr. Davis' offices were at 4 West Thirty-third Street, 31 West Thirty-second Street, and 13 East Thirty-third Street, New York. His clientele for many years was very large, and included many of the distinguished New York families.

Though not a graduate of a dental college, Dr. Davis' professional training had been of the severe type belonging to the early gold filling period, and his methods of practise were carried out with great thoroughness and consistency. He was particularly a master in the manipulation of Abbey's "soft" foil, and few men could equal his standard as to solidity and finish in the use of that gold. He was a consistent believer in the filed separation between teeth where decay had taken place. Such surfaces were boldly formed, the fillings made flat, and the whole highly polished. He preferred the use of napkins, to the rubber dam, in maintaining mouth dryness, and the hand excavator, to the engine; yet his operations were performed with certainty and celerity. He was vigorous and even severe in his work, seldom sparing the patient or himself where a difficult case presented.

Dr. Davis was below the average in height and weight, but broad shouldered and of wiry build. His personality was a genial one, with all the strength and consistency that comes with undoubted convictions. He was unmarried. He was for many years a member of the Union League Club of New York. He spent his vacations in travel, preferring Switzerland to all other countries. Dr. Davis had retired from practise about four years ago.

W. B. D.

NOTICE

MONTANA STATE BOARD OF DENTAL EXAMINERS,
BUTTE, MONT., April 8, 1912.

The Montana State Board of Dental Examiners will meet in Helena, July 8, 9, 10 and 11, for the regular annual session. All desiring to take the examination will please send in their application to the Secretary thirty days prior to July 8.

G. A. CHEVIGNY, Secretary,
106-8 Clark Block, Butte, Mont.

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No. 3

PREVENTION IN DENTISTRY TO-DAY

Signs are multiplying that there is a growing appreciation of the necessity for preventive measures being discovered and put into active operation. The larger views we have been able to take in recent years have brought a realization that if civilized mankind is to be rescued from physical decadence along dental lines, prevention must be the means, for it can easily be seen that there can never be enough dentists to treat and repair damaged teeth for all that need it. Only the favored few can be thus helped, whether they are those who can themselves pay for the service, or those who must be paid for by others, by private benevolence, or from the public funds, or by the generous gratuity of the dentists themselves.

The revelations made by systematic examinations of children's teeth, in the experiences of free dental clinics, and the activities of dental hygiene propaganda, have all tended to awaken added interest in study of prevention, which appears in an increased number of published communications on subjects germane to the etiology of dental disease or its prevention.

We have also the continued interest and support given to the investigations begun by the New York Institute of Stomatology three years ago, under the direction generously given without remuneration by Prof. William J. Gies, Ph.D., who is to make

a report of this last year's study of the possible causes of decay at the October meeting of the First District Dental Society of New York. Interest has centered on caries, no doubt because of the greater loss occasioned by it, and of its greater effect on the young.

Special attention may well be directed to two books that have been published this year in London, both having the same title, *The Prevention of Dental Caries*, and both making the claim of having discovered effectual preventive measures. This is rather startling, and as we recognize the urgency of demand for just such information as these two books claim to furnish, further consideration of their contents should be given them than has been accorded by the reviews published in our periodicals. Dr. J. Sim Wallace in *The Prevention of Dental Caries* begins his Introduction¹ with the statement that "Dental Caries is one of the most easily and certainly preventable of diseases, and there would seem now to be no valid excuse for the bringing up of children with decayed teeth." He seems to fear that commercial and other considerations will resist the "diffusion of the truth," but he says, nevertheless, that the profession has passed from the "most doleful pessimism" to "a most optimistic attitude," and "instead of anticipating the continued increase of dental caries, we confidently anticipate its more or less complete extinction."

The author does not believe that susceptibility resides in the physical character of the teeth, and attaches little importance to qualities of saliva and mucus, for "we are able by altering the dietetic régime to make anyone practically immune to caries." He says "*the cause of caries is the prolonged retention or stagnation of fermentable carbohydrates in more or less immediate contact with the teeth and undisturbed by the free access of saliva.*" The dietetic régime that is claimed to effect practical immunity is required to have a physical consistency that is stim-

¹ *The Prevention of Dental Caries*, by J. Sim Wallace, D.Sc., M.D., L.D.S. *The Dental Record*, London, 1912.

ulating to pleasurable mastication, and is calculated "to secure physiological cleanliness of the mouth," and by other qualities, such as acidity, to be stimulating to "saliva rich in ptyalin."

"We may divide foodstuffs," he says, "into two classes—namely, those which tend to leave viscous and fermentable carbohydrates about the teeth and those which tend to brush them away," and there is appended a list of the two classes of food, those "not cleansing and liable to induce dental caries," those that are "farinaceous and sugary food in general without fibrous elements;" and, on the other hand, food that is "cleansing and preventive of dental caries. Fibrous foods generally."

Dr. Wallace does not regard the toothbrush as of much help in preventing caries. He says: "What statistics we have seem to show but little reliance can be put on artificial procedures. Thus in the better class schools, where the toothbrush is at least sometimes used, there is no evidence that the teeth are better than in schools where the brush is not used;" and, further, "the cleansing power of true or effectual mastication is better almost beyond comparison than artificial cleaning."

These views on the effects of certain kinds of food and of the influence of acid food, are given further emphasis when we find in the other publication to which our attention is called, an amplification of similar dietetic rules, based on independent research work, with quite as confident claims of prevention of caries.

This appears to be the most comprehensive and systematic work on causes and prevention since Miller's classical work. Dr. Pickerill says in his Introduction:¹ "*The author is convinced that, by means and methods subsequently to be described, not only may the occurrence of caries be prevented, but in some cases actually 'cured.'*"

¹ The Prevention of Dental Caries and Oral Sepsis, by H. P. Pickerill, M.D., Ph.B., M.D.S. (Birm.), L.D.S., Eng. Prof. of Dentistry and Director of the Dental School in the University of Otago, N. Z. London, Bailliere, Tindall and Cox, 1912.

"In several patients (children) who have been under constant observation during the past two years, and in whom caries was commencing, not only have no more carious cavities appeared, but those that were present have not progressed, and the surface has become quite hard."

The author reviews the history of attempts at prevention, and he also gives the percentage of occurrence of caries in the teeth of different races of men among savage and uncivilized, as well as the civilized races of to-day. The pathology of the disease is described, and the various resistance of teeth of different individuals and races as indicated by the variations in the minute ridges or "imbrication lines" discoverable on the surface of enamel. Differences are noted that exist in the hardness of enamel as shown by the geological method of scratching, as the relative hardness of stones and gems is determined, and also the density and relative permeability of the structure. Then the saliva and mucus, with their variations in quantity and quality as affected by different foodstuffs and by dentifrices and antiseptics, are all tested by original methods. The means of prevention claimed by Dr. Pickerill to be effectual is purely dietetic. He shows by laboratory experiment that the food material having the greatest potentiality of acid production is starch in a finely divided state, such as appears in pastry, bread, biscuit, and chocolate, and, on the other hand, he says that "the most sapid substances are responsible for the least acid (cf. apple, potato, parsnip, orange, salad, and cane-sugar), bread crust also, by reason of the increased mastication, and therefore salivation has only developed about one-half the acid that the soft white bread has." Emphasis is laid upon food having flavor that excites salivation, and for that reason acid fruits are commended. The saliva following such food especially if well masticated is alkaline and contains much ptyalin. Foods are divided into those having an alkaline or neutral reaction and those that are acid, and the author assigns to the former, deleterious influences on teeth.

which can be antidoted by using afterward some of the latter (acid) kind of food. So important does he regard the effects of acids that he prescribes that "all meals should contain a fair proportion of salivary excitants, and, more important still, should both commence and end with some article of diet having an acid reaction."

We are reminded by this of Prof. Gies's suggestion, made about two years ago, that weak acids—such as dilute vinegar—be used, to rinse the mouth before or during the brushing of the teeth, to coagulate and break up the adhesion of the mucin, and making easy the removal of the bacterial plaque.

The work is worthy of careful study by every practitioner, and the conclusions of the author are worthy of more thorough testing than have apparently been applied to them. Indeed, it is somewhat surprising that systematic and extensive proofs of the truth of the assertions made are not offered by either of the authors, for it would seem most natural that they would have desired to make such demonstration of the reliability of their conclusions. Especially does this seem incumbent in the case of Dr. Pickerill's work, for he urges the necessity of educating the medical and the dental professions and the laity in the truths which he has demonstrated scientifically in the laboratory, and further advocates the enactment of legislation to limit the amount of starchy and sugary foods by excise taxation, just as alcoholic beverages are dealt with, and that the subject should be made a branch of the public health service.

But it seems improbable that such legislation should result from knowledge of laboratory experiments without practical demonstration of the correctness of conclusions. Juvenile Charitable Institutions furnish such a practical field for testing the results of such dietetic rules as Dr. Pickerill claims to be effective in prevention, that the question arises whether it would not be worth while to make such tests here in this country. The co-operation of the officials and of dentists interested in such institutions could

no doubt easily be obtained. A study of the two works under consideration excites a desire to recommend such dietetic tests to private patients and to all who can be influenced, but it is easy to see that statements of results of any number of such isolated experiments would be far from having the convincing character that would come from tests on large numbers under control, after preliminary examinations, to be followed later by demonstrations of results.

Recognition of the value of Dr. Pickerill's work and of the importance of his conviction that he has found the efficient means of preventing decay, is far from suggesting any relaxation of the study of decay and its prevention here. It should only increase our desire to push forward such work more energetically.

The urgent need of preventing dental decay has never been presented with so much force as since the establishment of free dental clinics.

Efforts to tabulate the work of such clinics by the writer and arrive at an average cost of treatment per patient have not been quite satisfactory as yet, but we may get a suggestion of the magnitude of the problem of dental decay from the published estimate furnished the United States Bureau of Education by Dr. Thomas D. Wood, Professor of Physical Education in Teachers' College of Columbia University. He is reported to have stated that of the twenty million school children in this country, ten million have defective teeth, which are interfering with their health! What could all the dentists of this country do toward repairing the teeth of ten million children?

Compare for a moment governmental interest in the subject of the chestnut tree blight. The national Government has made an appropriation to assist in antagonizing the blight, and some of the Middle and Eastern States have also made appropriations for the same purpose that require six figures for their expression. The dental blight on the children is not so easily observed, but the importance and necessity of preventing its continuance is being constantly more appreciated.

We cannot at once accept the conclusions of Dr. Wallace and of Dr. Pickerill that the problem is solved. We look for proofs and meantime urge the necessity of more study and of making known the need of money to carry on the investigations necessary to a better understanding of the subject. It is evident that interest has been growing in foreign countries. It is hardly supposable that this country will lag behind in such work.

J. MORGAN HOWE.

PRACTICAL PROSTHETIC CASTINGS¹

BY F. EWING ROACH, D.D.S., CHICAGO, ILL.

From a scientific viewpoint the subject of dental casting has been pretty thoroughly covered. The general technique is now quite familiar to all. The behavior and manipulation of waxes and investment compounds have been well discussed and, to most of us, this phase of the subject seems to be sufficiently well understood to warrant a feeling of satisfaction, so there seems to be but little need of directing your attention to this feature at present. But when we come to the construction of the great variety of prosthetic pieces we are confronted with a very different proposition.

A careful study of the situation has convinced the writer that the profession at large has not made the most of the casting process in prosthetic procedures. Dr. E. G. Coolidge, of Chicago, has just completed a canvass of the members of the Illinois State Dental Society and he reports some interesting data regarding the status of the cast gold inlay in our state. He found that an average of 58 per cent. of the profession are using gold inlays, as against 42 per cent. who are using foil fillings. Similar data secured by your essayist show that a very much smaller per cent. have adapted the casting process to their prosthetic work. And while this splendid means of constructing our prosthetic pieces, such as crowns, bridges, splints, partial plates, etc., is far superior in many respects to all other methods, its advantages have, nevertheless, been overlooked by the great majority of the profession.

In my opinion all prosthetic pieces except the full denture can be made quicker and better by casting than in any other way. And when we say better, we mean more accurate adaptation and anatomical reproduction, with greater facility and equal strength. The limitations of casting to this class of our work are the limitations of the dentist himself and not of the process.

Certain inherent physical difficulties surround the fitting and shaping of metals to the many intricate and irregular surfaces of

¹ Read before First District Dental Society of New York, February 5, 1912. See discussion, p. 352.

the teeth and mouth by the swaging method that do not present themselves with the casting process. With castings it is a question of technique only.

If the profession have not made use of castings in their prosthetic work to the same extent that they have for inlays, the question naturally arises, Why is this the case?

There are several factors that contribute to this condition. For a number of years prior to the introduction of the casting process we had studied the question of cavity preparation for inlays; and the permanency, as well as the many other questions regarding the inlay method of filling teeth, had been quite satisfactorily and favorably settled, so that we were in a very receptive mood, if you please, for the cast inlay. It came at a time when the whole dental world was ready to grasp it and make practical use of it at once. Had it been given to us ten or fifteen years earlier it would not have reached the same degree of popularity that it did in so short a time.

The variation in inlay technique, brought about by the casting process, was practically only a step, and that a very much simplified step, too, while in prosthetic procedures we have had to make many, many changes in the details of our construction. We are constantly changing and improving our methods of doing this, that, or the other thing until, under the new régime, we will eventually arrive at the one best way of doing them all.

No two cases, of course, will call for exactly the same treatment, but similar methods will be followed for a certain class of cases. Our cases will be classified and our work systemized so that we will have a generally accepted method of doing each class. There is need for a better understanding of the difference in the physical characteristics of ROLLED or *drawn* metals from those of the castings. We very frequently see bridges and partial plates made of what I would term junk gold, using all the old crowns, bridges and the like, that accumulate in the office by melting them all together and without refining, cast them into some practical piece. This is a practice that cannot be too strongly condemned. Such castings are brittle and unless in large masses, will not withstand the strain that is likely to be brought to bear upon them.

An examination of the exhibits at the meeting of the Insti-

tute of Dental Pedagogics, in Chicago, last week, revealed the fact that the teaching of this subject is very meager. The prevailing objections to the teaching of casting methods in the dental schools were that the student did not get the required training in finger craft, and that the cost of materials was so much greater, that the management of the schools would not stand for the extra expense. Knowing that neither of these excuses occupied tenable ground, I made sufficient inquiry to satisfy myself that the teachers themselves had not worked out a system of technique in casting that they could offer as a substitute for the old methods. This should not be. The student should be taught modern, up-to-date dentistry. The methods in vogue five years ago are obsolete now, and it is an injustice to ourselves, and an imposition upon the public if we do not adapt this wonderful process to our prosthetic work.

It is a surprise to me to find so many who are still fitting bands, backing facings, and soldering them together; making the old two-piece gold crown with swaged cusps; bridges with dummies backed up and soldered individually to a swaged cusp to be subsequently assembled and soldered together. But we must expect that any radical change from the good old way will be made by most people in all walks of life very slowly, the dentist not excepted.

After all, the change is not so radical. It is more in learning to manipulate wax than anything else. Tooth and root preparation are practically the same. Taking impressions and making models are unchanged. It is simply a question of technique, and for that reason you will pardon me for spending considerable time and emphasizing details of construction.

We will take up first the construction of the cast base porcelain crown, the principles of which many of you are familiar with. In supplying a substitute for the natural tooth we should select methods and material that possess the greatest possibilities of reproducing the natural organ in appearance, strength and utility.

The successful crown should fulfill the following requirements: Good adaptation to root with reference to peripheral continuity and apposition to end of root; freedom from peridental impingement; close contact with approximating teeth, and at the



Fig. 1

CAST BASE CROWN.—*a*, end view of root; *b*, proximate view showing lingual interlocking shoulder, *c* dowel surrounded by cone of wax; *d*, porcelain crown showing how lingual extension is cut off; *e*, of cross section of completed crown



Fig. 2

PORCELAIN FACED CROWN WITH CAST GOLD BACK—*a*, proximate view of root; *b*, shows means of maintaining relation of facing and dowel while fitting to root; *c*, facing, dowel and wax ready for adjustment to root, *d*, tooth preparation for lingual hood and irridio-platinum reinforcement wire fitted to groove.



Fig. 3

CAST BASE CROWN FITTED TO SPLIT ROOT *a*, proximate view of root showing labial fracture held in apposition with wire; *b* shows groove from orifice of canal to periphery of root across fractured portion, *c*, crown, dowel, wax and fractured piece of root assembled ready for making cement model, *d*, shows crown and wax base in position on model and piece of root removed ready for wax duplicate.

Fig. 4

CROSS SECTION OF ROOT AND ROOT FACES —*a*, shows lingual interlocking shoulder
b, shows hole into head of facer; *c*, flexible guard pin.



Fig. 5

a, Shows irridio-platinum reinforcement connecting gold inlays in bridge and pyorrhea
splint cases; *b*, shows wire staple anchorage for occlusal restoration.

same time preserving interproximate space gingivally; correct occlusion, anatomical alignment with adjacent teeth, adequate strength and compliance with the cosmetic requirements.

As I have discussed fully, in another paper, the shortcomings of the various crowns that are in general use to-day, suffice to say at this time in this connection, that the cast base crown in my opinion, all things considered, stands at the head of the list for the ten anterior teeth.

The technique of this crown is as follows: Trim root to gum, enlarge canal for suitable dowel, enlarging or extending orifice of canal labially and lingually, Fig. 1, *b*, avoiding as much as possible weakening root by mesio-distal cutting. With the Universal facer the root is trimmed off labially below the gum by giving the facer a sweeping motion. The lingual interlocking step is now made by placing point of the flexible guard pin of facer into canal and forcing facer back until cutting edge is in line with lingual periphery of root; then by holding it in one position, the lingual surface is cut down, leaving the inner portion, *b*, standing. A groove is cut from orifice of canal to labial surface, *a*, the object of which is the reinforcement of wax at this point while fitting. It also adds stability to crown when set. Select any loose pin crown suitable for the case, grind to approximately fit root and grind off linguo-gingival angle, as in Fig. 1, *d*. Fit dowel to canal, allowing it to project just enough so that it will reach bottom of hole in crown when labial end of same just touches end of root, thus determining exact length of dowel. Iridio-platinum wire 13 gauge threaded is preferred, but clasp gold may be employed. The dowel is heated and forced through a cone of inlay wax, Fig. 1, *c*. Crown is placed over end of dowel, wax softened over flame while being held between fingers to prevent overheating, and when soft forced partly to place on root, remove, trim off excess wax. Repeat the above procedure until crown is fully seated, a perfect imprint of end of root is obtained in the wax, and excess of wax is trimmed to peripheral outline of both tooth and root, and sprue attached lingually. The crown is removed and the dowel with wax base pattern invested and cast preferable in 24-k. gold, *e* and *f*.

Porcelain-Faced Dowel Crown.

While the porcelain-faced form of crown is seldom necessary, there are cases where it may be employed advantageously. The technique for this form of crown is as follows: Prepare root, fit band and dowel as for the usual construction, a, Fig. 2, grind and fit facing in the mouth. The dowel is now removed and hammered flat on projecting end until wider than distance between facing pins. With knife-edge stone, file or plate punch make notches to correspond with pins. See Fig. 2 b. Facing and dowel in this relation are replaced in the mouth to verify the length of dowel, after which the dowel is threaded, heated and forced through a cone of inlay wax (c). Soften the cone of wax now, adjust facing and dowel with wax cone and force them to place on the root, having band in place at the time. Chill the wax and remove all parts together by passing an instrument under the band and working off carefully from side to side so as not to disarrange the parts. Trim off excess, remove facing, put carbon points in pin holes, and you are ready to cast and finish in your favorite way.

For this class of work there is no objection to the use of scrap and junk gold for the casting—preference is given iridio-platinum for dowel and 22 or 24-k. gold for band. The facing pins may be bent down at an angle for 45' or 50' in cases of close bite. Lingual Hood cast, d, Fig. 2.

Gold Crown.

There are a few that have adopted the cast cusp gold crown, but the technique of this crown is so little understood that its advantages over all other methods of construction are not appreciated. To my way of thinking, there is no other procedure that compares with it in any respect. The facility with which contour and occlusion may be produced is a marvel of simplicity and accuracy.

We frequently hear the claim made that this crown requires too much gold to permit of its general use. This objection I am prepared to prove is not correct. The technique of this crown is simple, quick and accurate, and needs but a few words to explain.

With tooth properly prepared, the band is fitted in the usual manner and contoured with pliers. Band should be made long

Fig. 6

Showing use of loose pin in molar as a means of facilitating the setting of bridges where abutments are not parallel, especially inlay abutments.

Fig 7

Labial, proximate and lingual views of compound inlay that may be used for short bridge abutment or for pyorrhea splint—especially adapted to lower incisors where proximate fillings are necessary. a, Plate 5 shows end view

Fig. 8

Buccal view of lower bridge, showing interproximate spaces in casting. a. Plate 9 shows proximate view of dummy with preferred adaptation to alveolar ridge.

Fig. 9

Shows use of vulcanite tooth by cutting proximate grooves for retention

Fig. 10

Cast lingual hoods united with solder to serve as a splint. Made by Dr. Hall Orr

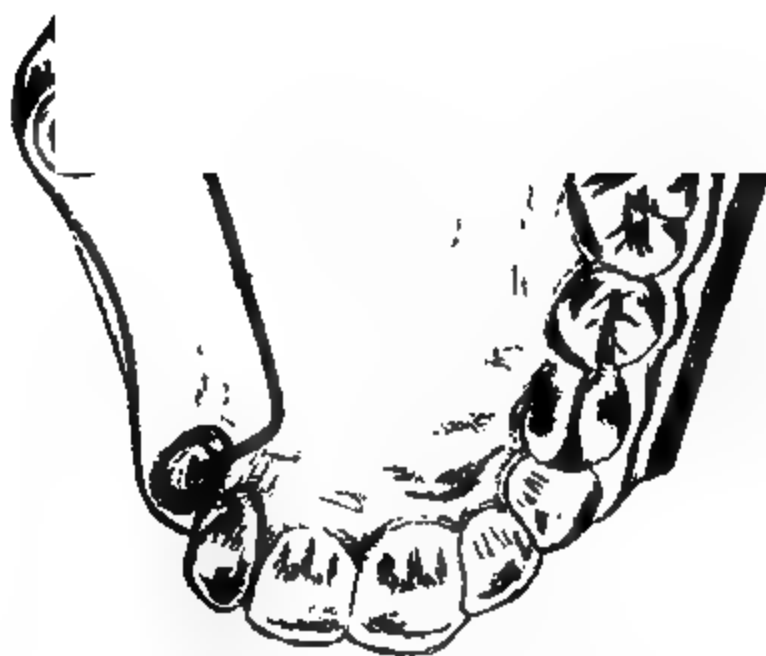


Fig. 11

Abutments united with bar to prevent displacement and facilitate handling while carving wax pattern for porcelain faced gold bridge—Bryant.

Fig. 12

Plaster retainer used for holding facings in proper place while carving wax pattern for cast bridge.

Fig. 13

Showing bridge constructed with Goslee teeth—Buccal view.

Fig. 14

Lingual view of same bridge.

enough so that it may be cut and fitted to approximate the occlusion. A cone of inlay wax is now softened and placed over occlusal end of band and patient instructed to close upon it. Chill the wax, remove together with the band, carve to anatomical form indicated, and with Suction Wax Carver remove any excess of wax from inside of crown. For this purpose I prefer the more transparent waxes so that the thickness may be more readily determined by holding up to the light while carving. Scrap and junk gold may be used for this class of work to better advantage than for any other purpose.

Split Root.

While the casting process has completely revolutionized all my prosthetic and operative procedures in everyday routine work, it has at the same time enlarged the field of reparative measures so that operations heretofore practically impossible of satisfactory accomplishment have become commonplace and simple, with results beyond our fondest hopes. As an illustration of this I am going to give you a description of a method of repairing split roots that has given me great satisfaction.

If our good friend Taggart had done nothing more than made possible the restoration to comfort and usefulness of teeth with split roots he would have rendered a great service to humanity. And while this operation is only one of many, it is unique in character and shows the possibilities of the process.

When a case presents itself with root fractured not more than one-half its length and the fractured piece is intact the repair is simple and positive. The procedure is as follows: Draw fractured part into close apposition by twisting wire around it, as in Fig. 3a. The steps outlined above for cast base crown are identical, so that when wax base is secured the piece of root is extracted and carefully placed in position on wax base—the groove across end of fractured piece and the side of canal affords a definite guide in locating it, b. The piece is now secured to the crown and wax base with wax, c. The fractured surface and dowel is coated with a vegetable oil and a batch of cement, mixed stiff, is pressed into apposition with fractured surface of root. When cement is hard it is scraped down flush with piece of root, after which it is separated from crown and piece of root. Piece of root is carefully

separated from wax base and crown with wax base readjusted to its proper position on cement model, Fig. d, and inlay wax melted into space originally occupied by piece of root and scraped down flush with surface of cement model. This gives us an exact reproduction in wax of the piece of root, united as an integral part of the original wax base in its proper relative position, which is also true of the casting. When cementing such a crown to place in the mouth I prefer to use Evans' gutta percha cement on fractured surface. Fig. 4, Root Facer. Fig. 5, Splint Orr. Fig. 6, Splint. Fig. 8, Bridge.

In my experience with casting I have made the following observations:

That nearly all prosthetic castings should be made in combination with iridio-platinum or gold in wire or plate form as a means of reinforcement.

That iridio-platinum on account of its great strength and freedom from oxidation affords the best reinforcement.

That 24-k gold reinforced with iridio-platinum is the best for inlay abutments.

That the reinforcement plan expedites as well as strengthens the work and obviates bulkiness, which is so essential in many instances.

That it is best not to heat any alloy of gold containing base metals to the point of oxidation when casting upon it.

That it is unnecessary and detrimental to heat a flask to a red heat or anywhere near it when burning out wax.

That the elastic limit of scrap or junk gold is practically nil and it should not be used where much strain will be brought to bear upon it.

That alloys of gold with platinum will become very brittle when cast a few times. This Dr. Taggart tells us is due to contamination with silica contained in the investment.

That the casting process makes possible the employment of almost all forms of porcelain teeth and that provision should be made for cementation rather than casting directly on to the porcelain.

That nearly all inlay abutments, regardless of size and shape of cavity, should have some form of supplemental pin anchorage.

LOCAL ANESTHESIA IN DENTAL SURGERY¹

BY HERR TANDLAEGE IMM OTTESEN, CHRISTIANIA, NORWAY.

We are living in an humane age. I may change Ibsen's words in "Brand" a little, and say, "Humane is the age; we will have no pain." I will not here discuss the question whether this is a sign of degeneration or not; but one thing is certain, that we as practising dentists make it our object to carry out all the operations of dental surgery in a manner as free from pain as possible.

There are two ways of accomplishing this object—namely, either by general or local anesthesia. Chloroform, ether, nitrous oxid gas, and other general anesthetics are well known in America, but are they desirable for use in our work, when we have such good local anesthetics as novocain in different combinations with adrenalin or synthetic suprarenin? I think not.

During the last seven years I have used exclusively local anesthetics in all operations of dental surgery, such as extractions, amputation of roots, extraction of pulp, opening the antrum, preparation of cavities, and separation of teeth. As long as we had to use exclusively cocain and before the discovery of adrenalin, local anesthesia could not be so generally employed because cocain alone was too toxic and the anesthesia did not last long enough to permit of finishing the operation. Later on, after Einhorn had produced novocain, and after the discovery of the artery-contracting effect of adrenalin, local anesthesia by injection came to be more generally employed. We are deeply indebted to Dr. Braun for his excellent research work in studying the pharmacodynamic influence of different anesthetics. He found that the state of anesthesia is due to a chemical combination between the elements of the cells and the anesthetic and not, as Dr. Schleich maintained, to the pressure of the solution on the nerve-fibers. Dr. Braun also pointed out what great importance arterial contraction at the point of injection has for the effectiveness and duration of the anesthesia. Adrenalin, and, still better, synthetic suprarenin, are indispensable additions to every anesthetic solution.

¹ Read before the Massachusetts Dental Society, May 2-4, 1912, Boston, Mass.

It would take too long to speak about the development of the technique of injection and the composition of the solutions. In this connection we may mention such men as Braun, Enler, Williger, Walkoff, Fischer, and others. Professor Giudo Fischer has written a book on the subject of local anesthesia, a book which I should like to recommend for your perusal. This book is of great importance to every one who has occasion to employ local anesthesia. Strangely enough he makes no mention of intra-alveolar injection, a method which offers such great advantages in dental practice.

The first place among the local anesthetics of the present day, I believe is held by novocain. Cocain has a greater anesthetic effect, but it is too toxic and cannot be sterilized by boiling. Novocain fulfills the chief requirements which Braun demands of an anesthetic. 1. It is as little toxic as possible in proportion to its anesthetic power. 2. It causes no changes in the tissues. 3. It can be used in combination with adrenalin and suprarenin. 4. It is easily soluble in water and can be boiled. Novocain is a white powder, and forms together with water a neutral solution which has the same effect on the sensitive nerves as cocain. A $1\frac{1}{2}$ per cent. solution is sufficient to anesthetize so large a nerve as the nervus ischiadicus. General effects after absorption are hardly ever noticeable. If novocain is applied to an inflamed wound you will rather find a soothing effect than an irritating. All who have used novocain are agreed that it is a relatively non-toxic substitute for cocain; and that it is indispensable in dental practice when painless treatment is demanded.

We employ it in a solution of from 1 to 4 per cent. strength, together with one drop of adrenalin or suprarenin to each cubic centimeter of solution. It is advisable to add small quantities of thymol and sodium chloride. I myself at present use a solution recommended by Fischer—viz.:

Thymol	0.025 gr.
Sodium chloride.....	0. 92 gr.
Distilled water.....	100. c.cm.

Of this solution I take 5 c.cm. and add to it, as a rule, 0.1 gr. novocain, which makes a 2 per cent. solution; boil it and add one drop of adrenalin or suprarenin, and draw it into the steril-

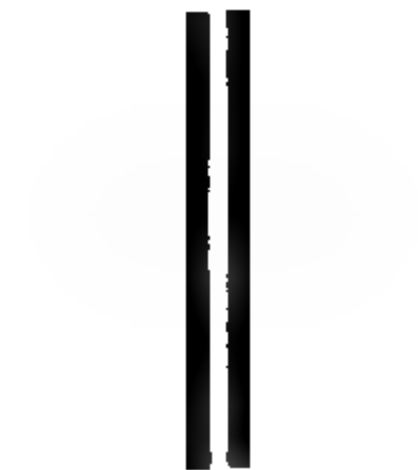


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

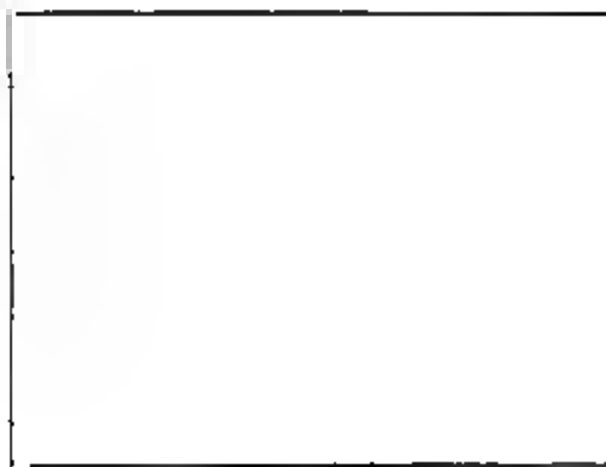


Fig. 9

Fig. 10

Fig. 11

Fig. 12

ized syringe. This novocain solution I make up freshly every day.

Fig. 1 shows my injection equipment. From left to right you see first the glass jar with the syringes. These are made of glass and steel as recommended by Fischer, so that they can easily be sterilized by boiling. These syringes have three detachable points, so that they may be used in different positions. After use the points are boiled and kept in this glass jar. The other syringe is to be employed in what the Germans call "Leitungsanesthesie." Perhaps we may translate the term into English as "conduction anesthesia." Next you see the bottle with the thymol and salt solution. Then the box containing the novocain capsules and the measuring glass for the novocain solution. As you see in the picture, this measuring glass is covered with a dark-colored glass cap. Besides these I have a little electric boiler and the medium dropper for obtaining an exact drop of the adrenalin or suprarenin. The novocain solution can also be obtained sterilized and ready for injection in small glass tubes, but in this case the solution is more expensive than if prepared by oneself. I wish here especially to emphasize the importance of always using a sterilized solution and sterilized syringe.

To make the injections properly it is necessary to be thoroughly acquainted with the anatomy of the jaws and teeth. Fig. 2 shows the labial and buccal portions of the upper and lower jaws, and it will be noted that there are several small tubular perforations above the apex of the roots of the front teeth and in the septum between the teeth as well as in the region of the bicuspid in the upper jaw. In the lower jaw you will notice that these perforations are not so numerous. In the fossa mentalis will be found some small canals. In Fig. 3 you will see that these perforations are not at all so numerous. This is due to the age and individual differences, and that is the reason why in some cases you will have perfect anesthesia with gingival injection, and in some cases you will not. These perforations are more numerous in young persons than in old.

Figs. 4 and 5 give a side view of the jaws. In Fig. 4 you will notice many perforations in the region of the bicuspid, but in Fig. 5 they are not so frequent.

On the lingual side in the upper jaw are many perforations,

through which the novocain solution, by gingival injection, can penetrate into the spongiosa. Far back in the region of the lingual root of the wisdom tooth is situated the foramen palatinum anterior. By injection here and on the tuber maxillare, as shown in Fig. 6, you will obtain an excellent result by means of "conduction anesthesia." The anesthesia will reach as far as the wisdom tooth, the second molar, and the first molar.

On the lingual side of the lower jaw you will not find many perforations as can be seen from Figs. 7 and 8. There are some in the region of the front teeth.

Fig. 9 shows the foramen mandibulare, an excellent point for injection to obtain conduction anesthesia for the lower molars. This foramen is found by moving the finger along the linea obliqua externa to the lingual side of the ramus about one centimeter above the occlusal surface of the wisdom tooth. Another very important foramen for conduction anæsthesia is the foramen infra orbitale, a foramen easily found underneath the lower orbital ridge. An injection here will anesthetize the region of the front teeth and also the cuspid and bicuspid. The foramen mentale on the lower jaw is not so often used in the technique of injection. In some cases, for anesthetizing the bicuspid, an injection here will give good results.

We can divide the technics of injection into three groups—namely, 1. *Gingival injection*. 2. "*Leitungsanæsthesie*" (conduction anesthesia). 3. *Intra-alveolar injection*. By the first-named method you will, as a rule, obtain good results with nearly all the teeth of the upper jaw. The cuspids will sometimes be found difficult to anesthetize by this method, because, as you will remember, there are few openings in the bone in that region, so that the solution cannot easily penetrate into the spongiosa.

Before we commence making any injection we must make sure of the patient's state of health. If the patient has any heart weakness so that he is liable to be affected by the novocain-adrenalin, it is advisable to use a weaker solution, 1 or 1½ per cent., and to employ a compression bandage round the neck, as advised by Professor Guido Fischer, and as shown in Fig. 10. This bandage is to be made so tight that the patient's face becomes a little flushed. Before making the injection I always sterilize the gum by carefully rubbing it with a cotton pellet

Fig. 13

Fig. 14

Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

Fig. 22

Fig. 23

Fig. 24

dipped in a solution of tincture of iodine and tincture of aconite in equal parts. If you have a very sensitive patient, so that you want to make the puncture with the injection-needle quite painless you can spray the gum a little with ethyl chloride.

Fig. 11 shows the point of injection and the manipulation of the syringe in obtaining anesthesia of the front teeth on the right side. This puncture is made through the gingiva and underneath the periosteum, and it is very important to have the flat part of the needle-point pressed against the bone. Now inject the solution very slowly and gently with a steadily increasing pressure, and at the same time massage the gum a little with the left forefinger. One and a half cubic centimeter of solution will be enough in most cases to obtain anesthesia in the central and lateral incisors about five minutes after injection. The anesthesia will last from twenty to thirty minutes and sometimes longer. Fig. 12 shows the point of injection for the bicuspid. The injection is performed in the same manner as with the front teeth. As a rule, it is enough to inject only on the buccal or labial side, but there is no objection to also injecting a half cubic centimeter on the lingual side, making the puncture in the same manner as described above. The fewer punctures the better. When employing gingival injection for the molars it will generally be necessary to inject also on the lingual side in the region of the apex of the roots. But in the case of these teeth you will get better results by using intra-alveolar injections or conduction anesthesia, as I will describe later on.

In the lower jaw it will be very difficult to obtain good results by gingival injection. As far as the front teeth are concerned, the result may be satisfactory enough by injecting as shown in Fig. 13, the canula being directed to the region of the fossa mentalis, where the bone is porous. One cubic centimeter is enough to inject. When employing gingival injection for the bicuspid and molars you had better inject, with considerable pressure, in the inter-dental papilla, because the septum of the bone between those teeth is porous, but it is not advisable to employ this method, because, due to the high pressure, you may cause inflammation or necrosis in the gingiva. Here there is indication for intra-alveolar injection or "*Leitungsanæsthesia*." I never employ gingival or intro-ossal injections if there is inflammation.

Conduction anesthesia ("Leitungsanesthesia"), as advised by Guido Fischer, offers great advantages in extracting teeth affected with periostitis, or in the surgical treatment of abscess.

Fig. 14 shows the position of the syringe in mandibular anesthesia. The syringe is placed between the bicuspids on the opposite side, and the needle is forced through the mucous membrane into the region of the foramen mandibulare. Then inject one cubic centimeter, using massage, and after fifteen or twenty minutes you will obtain anesthesia from the wisdom tooth to the second bicuspid. Fig. 15 shows the manipulation of the syringe in the mouth. As you will notice, I use a longer needle and a syringe designed by Professor Williger. In mandibular anesthesia you must be prepared for failure occasionally, until you have experience in finding the right place for injection.

Another good place for obtaining conduction anesthesia for the upper front teeth, cuspids and bicuspids is the foramen infra-orbitale. Fig. 16 shows the handling of the syringe. With the left thumb you can feel the lower orbital ridge, under which in the center you have the infra-orbital foramen. With the left forefinger you then raise the lip and force the long needle through the tissue up to the foramen, and slowly inject one cubic centimeter, employing massage during and after injection. A more perfect anesthesia can be obtained by also injecting on the lingual side of the teeth you wish to anesthetize. There is indication for this form of injection in surgical treatment of abscesses beyond the apex of the teeth from the medial to the bicuspid tooth. Anesthesia will occur about ten or fifteen minutes after injection and will last thirty minutes and longer, so that you will have time enough to complete the operation. To obtain conduction anesthesia of the upper molars, you may inject one cubic centimeter on the tuber maxillare and a half cubic centimeter in the region of the foramen *palatinale* anterior. The position of the syringe for the first-named injection is shown in Fig. 17. It is convenient to use a double-angled attachment to the syringe with a needle 17.5 millimeter long. With this attachment you can easily force the canula upward and backward to the tuberosity, where we have the foramen through which the nervus alveolaris superior posterior passes into the maxilla, providing sensitive nerves for the upper molars. There must also, as mentioned be-

fore, be injected a half or one cubic centimeter at the foramen palatinale anterior, which is easily found on the lingual side in the region of the wisdom tooth.

Fig. 18 shows how the syringe should be handled in making this injection. Anesthesia sets in ten minutes after the injection. It is advisable to support the effect of the anesthesia for the first molar by also injecting one and a half cubic centimeter in the region of the apex of the lingual root. This method of injection will seldom fail, and is especially suitable in extracting molars affected with periostitis, because you avoid injecting into the inflamed parts.

The third method of injecting, the intra-alveolar, offers great advantages over the two methods described—namely, 1. The effect of the injection is more certain. 2. The quantity of the solution can be reduced. 3. Anesthesia is obtained immediately after injection. This method was first used and described by Dr. Joseph Otte, of Holland, in a paper read before the *Nederlandske Tandmeester-Vereeninging* in 1896. He describes the method as very practicable in extraction with the use of cocain solution without adrenalin, which had not then been discovered. Otte made the perforation into the spongiosa at nearly right angles to the root, using a trepan-drill one millimeter in diameter, and after having first obtained anesthesia of the soft part of the gums. This method was not very widely employed until later on, when the method had been improved and developed in Norway, and even at the present time it is not very generally adopted outside Norway. Four years ago I gave a demonstration of this method to a private gathering of dentists in Chicago. They admired the excellent results obtained by the method, but nevertheless were inclined to be skeptical, as they feared the danger of infection which might give rise to serious forms of periostitis. However, statistics in Norway extending over several thousand cases prove that if the injection is made with scrupulous care and aseptically from beginning to end, there will be no risk of infection, while you will have a certain method of securing painless treatment.

The Norwegian improved method is essentially the same as Otte's, except that the perforation is made on a level with the neck of the tooth and parallel to the long axis. Instead of a trepan drill we use a Beutelrock root-canal drill of the same diameter as the canula of the syringe.

When employing intra-alveolar injection you have to take the same precautions as in the two other methods. First and last, work *aseptically*. The syringe needle, drill, and solution must be absolutely sterilized, and this is best secured by boiling. Then rub the gum thoroughly with the iodine-aconite solution, and keep the place for injection free from the flow of saliva. Then inject a little into the gingiva, about two millimeters from the tip of the interdental papilla, wait one or two minutes and then bore through the hard outer part of the bone into the spongiosa. Great care must be taken to reach the septum between the roots without touching the pericementum. Otherwise, there will be soreness of the tooth lasting for several days. Therefore, in carrying out the injection it is necessary to be perfectly acquainted with the position of the roots in the jaw.

Fig. 19 shows the lower jaw with the outer part of the bone removed, so that the position of the roots can be clearly seen. You also see where the perforation must be made when anesthetizing the wisdom root. In this case it will be very convenient to use a right-angled attachment to the syringe, and of course also a right-angled hand piece to the engine. Fig. 20 shows where to penetrate the bone when anesthetizing the first and second molars. As a rule, the perforation is nearly always made on the buccal side, but if the crowns of the teeth are inclined outward it is more convenient to operate on the lingual side. The X-ray photograph, Fig. 21, shows how far the drill must penetrate into the spongiosa. To be sure of good results you can go as far as to the end of the roots, or as far as shown in Fig. 22. By injecting here you will nearly always secure anesthesia of the first and second molars, but it is always a good practice to inject on the distal side of the tooth you wish to anesthetize.

Fig. 23 shows the place to inject for anesthetizing the bicuspids, and this photograph also makes clear how far the needle shall go, while Fig. 24 shows where to penetrate for anesthetizing the cuspids. By injecting on the mesial side of the cuspids you will nearly always obtain anesthesia of both the lateral and medial lower incisors. When anesthetizing the upper wisdom tooth it will sometimes be difficult to hit upon the exact spot for injection into the bone, and in this case it will be best to employ gingival injection or conduction anesthesia. When using intra-

Fig. 25

Fig. 26

Fig. 27

Fig. 28

alveolar injection for the first and second molars I prefer, especially if the cheek is thick and stiff, to penetrate on the lingual side, directing the drill between the lingual roots in an upward and outward direction. As regards the bicuspid, it is easy to operate on the buccal side, either between the first molar and the second bicuspid, as shown in Fig. 25, or between the bicuspids. The X-ray photograph, Fig. 26, shows how far you must go up with the needle.

The upper cuspid tooth is sometimes a little difficult to anesthetize, but if you penetrate as far as shown in Fig. 27, you will always secure good results. The upper front teeth are, as said before, easy to anesthetize by gingival injection, but it is also quite practicable to use intra-alveolar injection. When penetrating between the lateral and central teeth, care must be taken to avoid touching the pericementum, because as you know the roots of these teeth do not diverge much, so that the space between them is narrow, as shown in Fig. 28. You will notice from the same picture that the space between the centrals is sufficient to operate upon without any risk of touching the pericementum with the drill.

Before pushing the syringe needle into the spongiosa you must carefully sterilize it, either by drawing it through the flame of a spirit lamp, or, still better, by leaving it in boiling water between the first and second injections. Then take care that there are no air-bubbles in the syringe, and inject the solution with a very gentle pressure. About a quarter of a cubic centimeter is sufficient to produce anesthesia. Maintain the pressure while withdrawing the canula, so that the passage becomes filled with solution, thereby excluding a possible risk of infection through the hole. Such risk, however, has been proved to be practically non-existent. We have fully discussed this point in our dental societies in Norway, and we have come to the conclusion that the contraction of the tissues follows so closely on the withdrawal of the needle as to preclude the possibility of an invasion of microbes.

In concluding this paper I want to emphasize the most important points to be considered when employing local anesthesia. In the first place, the general health of the patient must be taken into account. If any heart disease or other weakness is present, employ, as already mentioned, a compression bandage around the

neck and use a weaker solution. Secondly, be careful to select the method of injection most suitable to the case in hand. Above all, *work aseptically at every step of the operation*. Keep the patient under observation during and after injection.

While thanking you for the patience and attention with which you have followed my remarks, I may express the hope that I have made clear to you the most important considerations in connection with the subject of local anesthesia. If there is any point that is not quite clear I shall be glad to answer any questions put to me in the discussion that may follow.

If I have succeeded in awaking interest in this important subject among my American colleagues, so that they may be induced to give the methods a trial in their practice, and thus, I firmly believe, confer a benefit on suffering humanity, my object will have been attained.

IS INLAY CASTING A FAILURE?¹

BY THOMAS P. HINMAN, D.D.S., ATLANTA, GA.

Answer to the question propounded by the title of this paper must be in the affirmative if the method of cavity preparation and casting as used by many operators is followed.

In the beginning I wish to state clearly that I am of the confirmed opinion that it is impossible to make a wax core in a tooth, remove, invest and cast it, and produce a fit with even fairly good margins. This conclusion has been forced upon me by attempting to cast an inlay for a cavity cut in a porcelain tooth. Although I have made numerous attempts to produce a perfect inlay, using practically every form of casting machine, yet I have never produced a perfect fit. A great many inlays when cast, apparently fit the cavity when placed in the mouth, the operator being deceived by the saliva making the joint invisible. Again, I would ask the question, How do we know that our cast inlays fit the cervical margins, for with correct cavity preparation, this margin is invisible when the inlay is in position? It is at this point that inlays fail to fit more than at any other part of the cavity. The attempt by some operators to make universal application of the inlay in every cavity to be filled with gold must result in a large number of failures.

Inlays are being cemented in place indiscriminately, whether they fit or not. It is my observation that the profession has become hysterical on the subject of cast inlays; and machines, appliances, and investments of every form and description, for casting gold, are being exploited.

The universal application of the gold inlay, in my opinion, is ill-advised, for many cavities are better filled by the use of cohesive or non-cohesive gold.

There are many reasons why, when gold is cast from a wax matrix, it will not fit the cavity, and the following are some of the causes that contribute:

Bad Waxes.—In these I mean waxes that are totally unfit

¹ Read before the Mass. Dental Society at its 48th Annual Meeting, May 2-4, 1912, at the Harvard Medical School.

for the purpose for which they are used, having no edge strength, distorting from thermal change, having insufficient rigidity and poor carving qualities.

Bad Investments.—Many materials are placed on the market for the purpose of investing which are not scientifically compounded. These give changes during the process of hardening and heating, which produce an inlay so distorted that it cannot fit the cavity. Many good investing materials are spoiled during the mixing process, because if we wish to get the same result in every mix, it necessarily follows that the same quantities of water and investing material must be used for each mix. It is only by careful weighing or measuring that we are able to produce similar results every time. Some investing materials that I have tried crack so badly that the lines show on the cast inlay. A great many of these cracks, however, can only be discovered by the use of a magnifying glass. Different investing compound must be used for different machines.

Changes that Take Place between Molten and Solid Gold.—When gold is melted it always takes a spheroidal form, and when it is cast it shrinks toward a common centre, therefore, the sprue wire should be placed at the centre of distribution and sufficient pressure maintained on the gold to partially control the change that takes place during the transitional period between the molten and solid state. If pressure is not maintained, the gold has a tendency to shrink from the margins. Many failures come from this cause.

Incorrect Cavity Preparation.—It is most essential, in the preparation of the cavity to be inlaid, that the walls and particularly the floor of the cavity, should be left perfectly smooth. If various indentations are left in the walls and floor, their sharp borders are rubbed off by the molten gold as it flows to place. Have you ever cast an inlay for a bicuspid or molar where the anchorage is in the crown and had the inlay ride along the neck of the anchorage? This was caused by the fact that in the neck some sharp angles were left and the gold as it flowed to place rubbed off these thin margins of investment.

Insufficient Anchorage.—There is one rule in cavity preparation which I have advocated for many years, and have repeated so many times that I fear it will be ancient history to you;

but since I have lost a considerable number of cast inlays through insufficient anchorage, I do not deem it unwise at present to repeat: *The cavity to be inlaid with gold should be so formed that when the inlay is placed in position without cement, it cannot be dislodged by the force of mastication.* If deviation from this rule is practised in cavity preparation, failure will inevitably be the result, for cement alone cannot be depended on to hold an inlay in position, and at the same time resist the stress of mastication.

Technique of Making Core.

Realizing the fact that I cannot cast inlays to fit cavities by the direct method, I have adopted the practice of making my inlays by the impression or indirect method, as by this means I am certain more perfect results may be obtained. The cavity is prepared along well accepted lines, and impression is taken of each cavity separately with a small German silver cup prepared specially for each case. This cup is made by bending a piece of 36-gauge German silver-plate, which has been cut considerably wider than the cavity. The portion of the cup going between the teeth is trimmed smooth, so that it will pass easily beyond the cervical margin of the cavity. In this cup is placed Perfection Modeling Compound, which has been warmed in dry heat. This cup, filled with modeling compound, is pressed to position between the teeth, being held firmly with the finger; an instrument such as a thin spatula is forced in between the cup and adjoining tooth, thus pressing and holding the modeling compound into perfect apposition with every portion of the cavity. The compound is then thoroughly chilled and removed from the mouth. This impression is thoroughly dried and then a small pellet of compound which has been made extremely soft is placed in the impression and it is again forced into the cavity, the hard compound acting as a swager to drive the softer material into every portion of the cavity. By this double impression method I have found that I am able to take perfect impressions of my cavities; whereas, if only single impressions are used, the forms are frequently defective, these defects not being readily observed in casual examination. This cup and compound is then invested in plaster and copper amalgam thoroughly packed into the impression and allowed to harden. The plaster is then broken away and

the modeling compound warmed in water and removed from the amalgam. We thus have a perfect replica of the tooth and cavity in metal. The inlay wax is then forced into this cavity and carved to suit the case. If the operator wishes, this core may be tried in the mouth to insure perfect proximate contact and occlusion. However, this is not often necessary in the ordinary proximo-occlusal cavities. The wax matrix is invested and the inlay cast, and then replaced in position in the metal model. In the many inlays I have cast I have never yet found one that fitted this metal mould perfectly. However, if the inlay be placed in the cavity in the mouth, in the majority of cases it seems a perfect fit, but when placed in position on the model and an ordinary 3-diameter reading glass placed over it, you will readily see that the inlay does not fit the margins. This is especially true at the cervical. Two methods are used for making the inlay fit the cavity. One is placing it in an ordinary swager and covering it with the rubber block and driving it to place. I prefer, however, to take a heavy flat burnisher and rub the gold down to the margins. In some instances it may be ground with a carborundum stone, but there is some danger of injuring the margins of the cavity unless exceptional care is used. The inlay is then polished, being held in position on the metal model and the margins brought to a perfect fit. It is then tried in for proximate and occlusal contact. If both are perfect, it is then ready for cementation. If either be too great or too little, the inlay is placed on the model and ground down, or some gold added to the inlay with a blowpipe and solder.

Cementation.

Great care should be exercised in this particular feature of inlay work. Many inlays are allowed to become failures because of the fact that the operator uses a cement totally unfit for this purpose. We should have a cement whose granules are very fine, for there are some cements on the market the granules of which measure about .05 of an inch. If, however, a cement of proper consistency is used and a portion of the cement smeared in the cavity as well as on the inlay, and inlay pressed in and held firmly and the margins thoroughly burnished with a smooth bur-

nisher during the hardening process, we can expect to produce an inlay that is ideal.

Inlays as Bridge Attachments.

Gold inlays are being used constantly for attachments for bridges which are supported by vital teeth. In a great many instances these inlays have not been satisfactory. The reason for this is the fact that frequently the operator casts the inlay out of pure gold, and as we know cast gold has very little more rigidity than lead, the inlay soon bends sufficiently to cause the cement to give way and the inlay become loosened. These inlays should always contain either 5 per cent. platinum or silver. This makes them very much harder, and the inlay is more rigid when made this way. I have been using inlays for abutments for bridge work for a great many years, and have had a number of them get loose, but since I have adopted the plan of using pins in inlays, I have had very little trouble of this sort. The technique of placing the pins is as follows: In the basal wall of the cavity two openings are drilled with a No. 3 bur and parallel with the long axis of the tooth. These should be placed some distance from each other, and extend the depth of at least 1-16 of an inch into the dentin. Pins are made of 20-gauge iridio-platinum wire, the tops of these being so flattened that when the wax is pressed into position they will adhere firmly to it. These pins give a great deal more rigidity of anchorage and prevent the lateral movement of the inlay in the cavity. I have had practically no trouble from loosening where pins are used to give additional strength for inlays in bridge anchorage.

HAS THE THYROID GLAND ANY RELATIONSHIP WITH THE DEVELOPMENT OF THE MOUTH AND TEETH?¹

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Perhaps a better title would have been, "What is the relation of the ductless glands to the development of the mouth and teeth?" I hope that my audience will not get excited and think I am going to tell just the relation between these bodies and the fixation of lime salts in the body which includes the teeth. I simply have asked the question, and will leave it for each individual to decide for himself.

With your kind permission we will go back and try to connect the broken link in the chain of circumstances that has led the author to the conclusion that there is a vital something behind and lower down in the system than we have heretofore thought, that controls the deposit of lime and other mineral salts in the body, the lack of which is responsible for the many cases of deformed mouths and tardy development of teeth, and many other conditions which go to make up a very sad picture of human life.

In the early 90's I was convinced that adenoids played an important part in the development of the dental arch, and began to study the relation between adenoids, tonsils and deformed mouths. While I could not formulate any definite relationship, I felt convinced that the first thing to be done to remedy that trouble was to restore nasal respiration. With that view in mind I tried to get the family physician and the surgeon to remove the adenoids, but he refused absolutely to do anything other than what originated in his mind. This suggestion coming from a dentist, he declined, and in most cases sent the patient's parents away with the idea that the dentist knew nothing of what he was talking about. After experiencing these humiliations for a year or two, I decided to do the work myself. The operation was to remove the adenoids and tonsils, and this was done with such beautiful results that it was truly a pleasure to do the work. A certain number of cases, however, showed little or no improve-

¹ Read before the annual meeting of the Massachusetts Dental Society, May 2-4, 1912, Harvard Dental School, Boston, Mass.

ment, and those were always the cases which I had thought offered the greatest likelihood of improvement. Why did some cases improve at first, then return, in about a year, with the pharynx all filled up and in as bad a condition as at first? Others showed no improvement whatever. I became convinced that I was doing repair work pure and simple, and not acting the part of the great physician, in preventing the disease. A few things came to my notice that were perplexing. Why did tonsils enlarge, why was there so much cervical adenitis, why were some children so backward in school, why were some children the terror of the school, with not one commendable trait in their character?

About this time a teacher in one of the grammar schools came to me with about this story: "Doctor, I have a boy who has been a disturbing element in my school for a long time. I have refrained from doing anything on account of his mother, but this week he has been caught stealing, and the truant officer is after him. We have got to act, and I have been thinking that his condition is due possibly to the condition of his throat. If you will operate on his throat for charity, as his mother has nothing, I will intercede for the boy and keep him in school and give him another trial." The report a month or two later was a beautiful result. He was quite a manly little fellow, and his disposition was wonderfully improved.

Finally, many of our teachers when they had a child that was simply devilish, would insist on his being taken to the doctor to have his adenoids removed; and generally with the most pleasing results. Remember this as a fact, that many a child's disposition has been greatly improved by having the adenoids removed.

In 1896 I was actively engaged in removing adenoids, and at the same time where a tonsil showed above the pillars of the fauces it was sacrificed. But there were so many other things connected with the throat, and so many other just as probable causes as enlarged tonsils, that I soon began to doubt whether the tonsil was the scapegoat for all the ills of the body. About 1900 I began to learn that the patient did just as well if the tonsils were left, providing they were not large enough to seriously interfere with breathing, or were not thoroughly infected with pus organisms. Previous to this, we had found that by widen-

ing the arch we also widened the floor of the nasal cavity, which made room for breathing and also for drainage, and which gave far better results than if the tonsils were removed and the turbinates left hard down on the septum. Still there was a small number of cases that did not do as well as I had hoped. For even after good breathing had been established there was no systemic improvement. I now became convinced that there was a vital something that controlled growth and development of which we were in ignorance. Still the results were good enough to warrant our going ahead and doing anything we could to establish nasal respiration, considering that one of the essentials of good development.

About 1908, the first ray of light began to dawn. Dr. Ahearn called my attention to little Joe, and gave me the following notes: June 22, 1897, was called to see J. G., age, 9; weight, $36\frac{3}{4}$ pounds; height, $35\frac{1}{2}$ inches; stunted, broad flat head, thick nose, physical and mental development slow, was 4 years old before he could walk. At 5 years if his mother laid him on a lounge, he would lie there all day without moving. At that time thyroid extract was given, 1 grain twice daily. October 24, his height was $38\frac{3}{4}$ inches. You will note that in the short space of four months he had grown almost 3 inches.

On the administration of thyroid extract he began to grow and develop mentally at a rate most astonishing. Here was something to work on. If thyroid extract would do such wonders in certain children, might it not be used in other cases of delayed dentition? During the period of the greatest development, if little Joe went without his thyroid he became a veritable little devil. Nobody could do anything with him. Then Joe would sometimes go to his mother (of his own accord), and ask for his medicine, and as soon as he got under the influence of the drug little Joe was himself again. As soon as the thyroid was administered his temporary teeth began to drop out and his second teeth erupted, but very erratically, some teeth coming before those that were supposed to come earlier. His second teeth were of rather a poor quality. Let me ask a question right here, Why should we find a person over twenty with sometimes four or five deciduous teeth, and practically all of those retained temporary teeth of a superior quality? Is it due to the lack of functioning of one of the ductless glands?

In 1911 two cases of Acromegaly were brought to my attention. The one case had been a patient of mine for many years, and I had noticed that something was wrong with her, but was unable to make out just what was the trouble. Bridge work put in her mouth would not stand, the bite was changing, the lower teeth were separating, some of the long bones of the body were growing, especially the lower jaw. She complained of her hands, she was not able to use them at any fine work, couldn't sew, she had to get larger gloves, complained of her feet, occasionally had to get a larger shoe, was somewhat clumsy, had a thickening of the skin and a broadening of the bones of the face. Here were two cases where some of the bones of the body and especially the inferior maxillary were growing long after the normal period of growth had ceased. I think that the best opinion among medical men is that Acromegaly is due to a hyper-activity of the pituitary gland, which lies at the base of the brain in the sella turcica of the skull. A peculiar condition arises right here. While Acromegaly is a disease of the pituitary body coming on after maturity and continuing during the rest of life, it does not seem to shorten life to any great extent. On the other hand, if we find a diseased pituitary body during childhood we get a decidedly different condition. In this case we have giantism, a disease most commonly found in countries that have had long civilization and a marked tendency to degeneration. In giantism the patient seldom lives long beyond maturity. In either case there is a disturbance in the fixation of mineral salts in the body probably due to the pituitary, one of the ductless glands, not properly functioning.

During the summer of 1911 the writer visited Europe for the purpose of studying disease conditions over there, and was much impressed with the manner in which different localities were handling certain conditions.

In Glasgow, and the valley of the Clyde, a most deplorable state of things existed, in regard to which the community had settled down to the belief that it must exist, and accordingly, were taking no action toward improvement. In some sections of the city seemingly over 90 per cent. of the people were deformed due to a condition recognized there as rickets. The legs were deformed, bent, bowed, knock-kneed, and in every shape known to archi-

ture. The percentage of straight legs was terribly small, and the percentage of legs of length proportioned to the rest of the body still smaller. While the women had deformed legs, they also had deformed pelvises, and as a result Caesarean section is a very common surgical procedure, one surgeon stating that he had seen five cases in one hospital in a week.

At one of the homes for crippled children where they had scores of utterly helpless children, mostly due to rickets, they also had deformed and helpless children from other causes, and children too hideous to be seen on the streets. They pointed with a good deal of pride to the improvement in the health of their little patients due to good care out of doors, all the sunshine the climate afforded, and good food, especially cod liver oil. While they were doing a marvelous work repairing the deformed children they were doing nothing to prevent the deformity. The most striking thing that I saw there was the similarity of the teeth of the child afflicted with rickets and those of the cretin. In fact, the children with rickets could all be picked from the others simply by their teeth. The temporary teeth were better than those of the average child. There was delay in losing the temporary set and delayed eruption of the permanent teeth. When the permanent teeth were erupted they were of a decidedly poor character and decayed early, the mouths of these children being in a deplorable condition.

In asking any of the profession or any of the social workers what was the cause of so much deformity among the native population, their answer was invariably, "Poverty and poor tenements"—a most absurd answer, as in no other large city of the British Isles was there anything like the number of deformities due to rickets as was found there. It is absurd to think that Glasgow was so much poorer fed and housed than any other city of the Kingdom. In London a different deformity existed, which we will refer to later.

We will make a comparison of the nurses of the British Isles with the nurses of some of the other countries of Europe. Take Holland for an example. The nurses will make a fair comparison, as they are likely to be taken from the same stratum of society. In Britain they vary wonderfully in height, but all have thin, light weight faces and narrow arches and extremely poor

teeth if they have any at all. Few of them looked as if they were physically able at all to be a mother, and many of the nurses were ending up as inmates of the hospitals. In Holland what a different condition! The nurses there were mostly of a uniform height with the most splendid physique and much heavier in weight than their British sisters, and every one of them the very ideal of what a mother's physique should be; besides, and most of all to be desired,—a most beautiful mouth, wide arch, well-formed and well-kept teeth. How can we account for such a difference? Surely the British girl is as well fed, as much in the open air, does not work any harder than her sister in Holland; then why the difference?

We will now return to London. It was my privilege to be there on a bank holiday and we imbibed the spirit of the day, and along with the London coster girls hied to Hampstead Heath to spend a day of recreation out of doors. There must have been fully 500,000 people, largely from the Whitechapel district and other crowded sections—a peculiar mass of humanity and peculiar customs. Although it was one of the hottest days that the weather bureau ever recorded in London, the young lady who was planning to go, procured all her finery, especially all her furs, and donning everything she owned, went to the Heath. The difference in the sexes was most marked. On such occasions the Government encourages the soldiers to dress up in their best clothes and go to those outings, presumably as an advertisement for the army. A slick, well-groomed, tall lot of men, and as they mingled with the rest of the crowd, it was most striking and showed up the inferiority of the London youth to a terrible disadvantage. Not 2 per cent. of those young men could in any possible manner, or under any subterfuge, get into the British army. Small, deformed, round shouldered, thin, small lung capacity, and, if they had any teeth, they were in two rows; for the mouth wasn't large enough to contain the required number of teeth in any other manner. The women were of a different type altogether. They were a little short, not much, a magnificent pelvis, and well balanced, a good bust, and good breathing space. Why this difference? The girls will stand on the streets for hours at a time or as long as the music lasts. No matter what it is, hurdy gurdy, harmonica, or a boy whistling, they will arrange

themselves in rows, and dance and sing at the top of their voices, or make a noise of some sort. In dancing they balance themselves first on one foot, and then on the other, with a to and fro motion, then a decided forward motion and then backward. Very seldom any boy gets into the row. They will dance for hours at a time with a most graceful motion, and a woman will hold a baby in one arm, and have the other around the neck of the next woman to her and never have occasion to hitch up the baby, or to take the other hand to arrange the child. The grace and ease with which they dance, and how a woman dances with her arms full of parcels, and a baby included, and never has occasion to arrange anything that she may have in her arms, is most surprising. The boys do the heavy looking on, or, at the most, play the harmonica, and truly they show the difference in their mouths.

It is evident that locality and habit has much to do with the condition of the mouth and teeth.

Now, let us see what the ductless glands have to do with growth and the nervous system of the animal kingdom, including man. We can experiment on the animals, and later be in a better position to practise on man.

Mayo says: "The common expression that 'Man is as old as his blood-vessels' is no longer tenable. We know that his growth and his manifest age depend on the glands of the body which control function and metabolism, as well as the vessels themselves."

It is becoming more and more apparent that of the various ductless glands, the thyroid is one of the most important in its control of the body metabolism, as well as in the maintenance and stimulation of function in many of the associated glands. While various diseases or changes in its structure are fairly common, marked anomalies are exceedingly rare.

The anastomosis of circulation in the thyroid is very free. When we consider that this circulation is so extensive in proportion to that of the brain, that the vessels arise from points closely associated with that of the brain, with a blood supply which cannot be destroyed except by deliberate act, and that it has free venous return, had we no knowledge of its function we could easily understand the importance of the organ.

The parathyroid bodies are four little gland-like structures,

usually situated behind the thyroid gland, two on each side. The upper one is most commonly at the side of the larynx, close to the esophagus and superior thyroid artery. The lower one is located close to, or below the inferior thyroid artery. These glands may be displaced, increased, or decreased in number, and while usually behind the intimate capsule of the gland, they may be inclosed with it in the capsule, in which case an ordinary extirpation would remove these glands with the thyroid.

Our present knowledge indicates that a most unfortunate complication, tetany, which occasionally follows removal of goiter, is caused by the loss of, or injury to the parathyroids. These bodies usually can be recognized—small, fat, pinkish or yellow in color, flattened ovoid bodies, ranging in size from minute structures to $1\frac{1}{2}$ cm. in length.

As the removal of supposed lymph glands or small accessory thyroids is not essential in an operation for goiter, we make it a rule to implant such bodies, when accidentally removed, into the capsule of the remaining lobe, or in some other acceptable location in the exposed tissue of the neck. It is quite possible that the human being with the four parathyroids has some to spare, and that if those on one side are preserved no untoward consequences will follow.

Apparently, the parathyroids control in some way the calcium metabolism, so that upon their removal a rapid excretion, possibly associated with inadequate absorption and assimilation, deprives the tissues of calcium salts. In the case of tetany the central nervous system seems to be especially affected, as has been demonstrated by experiments in which muscles isolated from the central nervous system, presented no twitching during the attacks.

However, the salts of calcium and other salts, may be concerned in maintaining a state of equilibrium in the function of the nervous system, and whatever may be the relation of the parathyroids to calcium and other metabolism, recent investigators state that all their experiences with tetany have shown that insufficiency of these glands is necessary for the production of tetany. This insufficiency occurs in experiments in the removal of parathyroidal tissue; and in the idiopathic tetany of man, is caused by an hypoplasia of the parathyroids in consequence of pathologic processes.

Dr. Rollison-Whitaker has written considerably on the relation of the thyroid gland to the mouth, and I refer to some of his articles. In regard to the regulating cases at the dental school, the first thing that struck me as being common to practically all these bad cases, was the fact that they either were then, or had been, suffering from nasal obstruction. It was further noticed that the cases that were still suffering in this way were less amenable to treatment than those which were no longer suffering. This lack of amenability was shown in two ways: (1) The machinery used for regulating purposes worked more slowly and less efficiently than in the others; (2) these cases with nasal obstruction still present, when got into a satisfactory state, showed a tendency to relapse when their machinery was removed.

Proceeding on these lines I then took a few of this type and removed their nasal obstruction, and as a result, their regulation proceeded to a satisfactory and apparently permanent termination, which before had not been obtained. Most unfortunately from the viewpoint of this inquiry, I also gave them all small doses of thyroid extract, as I have done to all cases of this sort for years. I hope to prove to you that this thyroid administration was at least as potent a factor in their improvement as the operation.

Ill-developed arches and dental irregularities on the one hand, and nasal obstruction on the other, when found present together, are not in any degree whatsoever dependent one upon another. Both of these conditions are independent, coincidental manifestations of a general pathological state which shows many other, though much less obvious, signs.

The general disease I refer to is one that has been exciting much discussion of late. It is due to inadequate thyroid secretion. The following is known about this condition. It frequently appears to date from an illness in childhood, very commonly of course one of the exanthemata, though it may appear independently of any known cause. How far the other suggested factor, namely improper feeding in infancy, is present as a predisposing cause, I have not been able to satisfy myself.

The signs and symptoms of thyroid inadequacy are these: The child is undersized, and still more markedly under normal weight. It has a subnormal temperature, a bad circulation, the

extremities are cold and blue, the child is mentally and physically lethargic. All its bones remain underdeveloped and unduly soft, owing to the lack of calcium fixation power.

It is known that the responsibility for the fixing of calcium salts, without which bone formation cannot properly proceed, is thrown upon the thyroid gland. The palate is contracted, and the succeeding dentition irregular, as the result of the subnormal development and abnormal softness of the bones of the jaws. Adenoids, or adenoids and enlarged tonsils are very commonly present. The lymphatic structures all over the body are enlarged. Caries of the teeth, including particularly the milk teeth, is present always, often to an appalling degree, a very much greater degree than is found in hospital patients of similar class and environment, but suffering from other diseases. This is another very important point for us, inasmuch as all dental text-books quote decay or premature removal of milk teeth as a possible predisposing cause of contracted arches and irregularities.

In thyroid inadequacy I feel confident we have a disease which, although its study is only now beginning, and about which much is still to be learned, will be found as time goes on to be the common, if not the only, cause of these conditions.

Broadly, the function of thyroid secretion is to fan the vital fires to greater fierceness. When the amount of thyroid secretion available diminishes, the vital activity decreases with it, and the chief weapon for the resistance of micro-organic invasion from without, the white corpuscle, becomes in its turn proportionately weak.

As a result of this, the lymphatic structures, which are the birthplace of the white corpuscles, hypertrophy in order to manufacture more. As enlarged tonsils and adenoids are merely hypertrophy of local lymphatic tissues, the pathologist from this standpoint will argue that their appearance in any given child may not be invariably an evidence of original sin, or innate naughtiness in that child, but rather a most praiseworthy attempt to help himself in the face of adversity. Here then, is the reason why contracted arches and adenoids and enlarged tonsils are so frequently found associated together. And the pathologist to-day is able to bring very strong evidence to support his theory.

It is now a recognized fact that enlarged tonsils and adenoids

in children tend to disappear under the influence of thyroid extract artificially administered, providing always that this administration is commenced while the glands remain in their original condition of simple lymphatic overgrowth, and before they commence to become altered by the appearance of fibrous tissues due to inflammation. Likewise included, will be another group of cases, those which after the removal of adenoids, etc., do not show marked general improvement, which is so confidently expected from the operation, and which do show it under the influence of the operation and thyroid extract.

The removal of enlarged tonsils and adenoids is a good thing in cases of contracted arches. But the operation and the administration of thyroid extract is a much better treatment.

Now, what is the practical outcome of all this? May it not be a rather important one? The two most obvious signs of this condition of insufficient thyroid secretion, which is no uncommon disease among children, neither is it one that can be safely neglected, are dental; they are signs that you will have the first and greatest opportunity of seeing. They are first, excessive caries in children's teeth, and secondly, a tendency to contracted arches. If you find one or both of these signs in a child that is subnormal in stature and in weight and that shows any or all of the other signs and symptoms I have enumerated, your duty it is to warn the parents or the doctor that the condition that you have been asked about, is but one of the signs of a general disease, the treatment of which, as a whole, will not only facilitate your part of the work, but be of enormous benefit to the child, both in the present and still more in the future. The treatment of the condition is simple, and consists of the administration of thyroid extract.

Professor Keith sums up his views as follows: "I am sure there is a relation more than a mechanical one between face development and adenoids, more likely through the pituitary body than through the thyroid, but probably both."

Dr. Waller says, "The influence of the thyroid activity may be affected by disease and different conditions of metabolism, and also by various drugs. The importance of this matter in practical medicine can hardly be overrated, seeing that thyroid secretions probably, to a large extent, are responsible for many of the

little details of daily life, the sum of which makes all the difference between being robust and delicate, enjoying life or being a martyr to various petty discomforts. Myxedema and Graves's disease must be taken as the two extremes of thyroid secretion—myxedema, of course, representing complete failure of secretion, and Graves's disease the utmost excess. But it is not too much to say that the intermediate conditions of thyroid secretion are just as important as the two conditions just mentioned."

One of the most important functions of the thyroid gland is that of fixing the calcium salts of the body. He points out further the relationship of thyroid activity to menstruation and pregnancy, and enumerates various minor signs of thyroid insufficiency, such as the presence of enlarged tonsils and adenoids, which are an attempt on the part of the organism to supply a secretion that is lacking. His evidence that nocturnal enuresis is due to failure of thyroid function, is indisputable.

Other minor symptoms referred to are subnormal temperature, hypersensitiveness to cold, loss and scantiness of hair, premature grayness, dysmenorrhœa and periodical migraine, and excessive dental caries. And he also points out that thyroid depression is liable to follow any acute illness.

Rickets in its worst form, starting as it does in the earliest months of life, is primarily caused by depriving the infant of the benefit of maternal thyroid activity, the infant's own thyroid secretion being invariably unequal to requirements at birth.

Enlarged tonsils and adenoids are a confession of thyroid inadequacy on the part of the organism, so we need not marvel if they are put into the pathological picture, which after all only represents some of the various phases of the rickety type. The moral of this is, that when you remove the tonsils and adenoids you must be prepared to give thyroid extract. But an amazing benefit seems sometimes to accrue to a child as the direct result of the operation. As a matter of fact, however, those with enlarged tonsils and adenoids are presumably less liable to suffer from calcium famine than those without. The secretion is worth something in spite of its pathological origin.

I now wish to show that this calcium famine in a minor degree almost invariably occurs as a sequel of the febrile diseases of childhood, and in the form of dental caries. Dental caries

is a subject of vast importance, and one which is being discussed all over the country at present, though I have not heard any mention of thyroid gland in the discussions; but an undue amount of dental caries should always excite a suspicion of thyroid inadequacy.

It seems probable in soft-water districts that the ordinary food would contain far more than the small amount of calcium required to make good the caries in these defective teeth, so that the real explanation is more likely to be that the caries in these children was due, in some measure, to a lessened efficiency of their thyroid glands caused by the greatly lessened supply of the normal stimulant calcium, which would occur not only in the drinking water, but also in vegetables and fruit grown in the districts. But an actual deficit of calcium is probably impossible, and it seems probable that dental caries, like rickets, is due to a greater or less disability to absorb the calcium provided, owing to inefficiency of the thyroid gland—the medium through which such absorption is normally carried on. The practical outcome of these considerations must naturally be the administration of thyroid substance to children, whose first teeth have been unduly carious, in the hope that the second dentition may be favorably influenced.

It may be stated by some that in many cases the teeth are already calcified in the gum, though not erupted. True, but the teeth are still immature, and it is necessary for their perfect development that there should be both an adequate supply of calcium and also power to absorb it.

Another cause of the increase in thyroid deficiency, and therefore indirectly in the increase of dental caries, may be found, I think, in the lower birth rate and increasing disability of mothers to suckle their infants.

I have already expressed an opinion that rickets, in its protean form, is caused by depriving the suckling of the benefits of maternal thyroid activity, which would, in the natural course of events, be obtained while at the breast. The same arguments apply in considerable measure to dental caries, and the two subjects are therefore interwoven. Dental caries is far less prevalent among savage races than our own. I have no doubt this is due, at least in part, to the fact that they nurse their children, thus both helping to maintain the thyroid activity of the race as a whole,

and conferring the benefits of individual thyroid activity on the infants, while patent baby foods and feeding bottles are absent, though I suppose they are making inroads like the rest of civilization. In the animal kingdoms also, dental caries is the exception rather than the rule, and I suggest that the reason here is the same—namely, that they suckle their young. On the other hand, of course, the laws of heredity and “the survival of the fittest” have their influence—considerable among savage men, absolute among savage beasts. Any with thyroid deficiency, whether manifested in the form of dental caries, or rickets, or any other malady, would soon be wiped out.

The nursing mothers have active thyroid glands, for it has been shown that, if thyroid secretion be deficient or absent, a mother cannot continue to suckle her child. Also, the administration of thyroid gland substance in such a case promotes or increases the flow of milk. Thus, breast-fed children start in life with an inherited tendency to thyroid activity, in spite of any subsequent depression that may occur as the result of measles or any other complaint. There is no doubt that the babe gets the benefit of its mother's thyroid secretion, acting through the milk, during the first months of life. The protective influence of breast-feeding against rickets has been placed beyond dispute. It is said that rickets is prone to occur in the younger members of long families. If this be so, the fact is easily explained on the ground of thyroid exhaustion whether due to natural worry, sickness, or accident.

It often happens that a mother is able to nurse all the earlier members of her family at the breast, but the supply partially or wholly fails when she has brought forth her “quiverful.”

It is quite certain that deprivation of breast-feeding has a very material influence in the production of adenoids and enlarged tonsils, and, in short, of most of the symptoms of minor thyroid inadequacy with which one meets in childhood. These subjects nearly all fall into two groups. Those that have had measles comprise about half the number, and the majority of the other half prove to have been bottle-fed. Some, of course, come under both these headings. It appears that measles is about the commonest and most potent cause of thyroid inadequacy, and I find that where a second operation for removal of tonsils or adenoids has been

necessary, the victim has not infrequently had an attack of measles between the two operations. This is a point of considerable importance, both for the patient and the surgeon. If the second operation is needed, the surgeon usually gets blamed for not having done the first one properly. But this is not necessarily the case at all. It is the business of the surgeon to remove the adenoids and leave behind the mucous membrane, which is the natural lining of the pharynx. So long as the mucous membrane remains, it is possible that the lymphoid tissue which it contains may again hypertrophy and produce adenoids. The determining factors will be, on the one hand, the continuance or otherwise of the thyroid insufficiency which first called the adenoids into being, and, on the other, the natural recuperative power of the child, which enables it to develop its own resources when thyroid secretion is in abeyance.

If, however, the first operation be followed by an adequate course of thyroid treatment, neither tonsillar enlargement nor adenoids are likely to recur.

Observations at the Zoo.

Young animals deprived of their mother's milk commonly die of acute rickets. Many litters of lion cubs have so perished, also young bears and monkeys. Rickets is also dreaded by every breeder of large dogs, if brought up "by hand." Young monkeys deprived of their mother's milk and fed on vegetable food—chiefly fruit—became rickety. Two young bears, fed on rice, biscuits and raw meat, the latter they hardly touched, died of extreme rickets. Young lions, fed on old horseflesh and one additional meal per week of lean goat's flesh, died of extreme rickets.

The evidence here is conclusive that the essential cause of rickets is deprivation of some ingredient contained in the mother's milk. Now, it was found possible to save the young lions by giving them a diet of milk, pounded bones, and cod liver oil, in addition to the raw meat diet, which without such additions proved fatal. Other conditions were the same, and the cubs soon lost all signs of rickets and grew up strong and healthy. Cheadle lays special stress on the influence of animal fat in the prevention of rickets. He adduces as further evidence the curative power of cod liver oil in rickets.

As to the diet of the young lions, they were deprived of their mother's potentialities; they died when fed on horse meat. The old horse's thyroid was probably pretty well exhausted, youth being the period of greatest thyroid activity. Also we must assume that lean meat is, at any rate, not rich in this thyroid ingredient, if it be present at all. The addition of milk, crushed bones, and cod liver oil was effective.

Cod liver oil has long been recognized as the best weapon we have wherewith to combat rickets. I cannot help thinking that the iodine content of cod liver oil is the essential factor here, and able, in some measure at least, to replace the iodine content of the thyroid gland.

I think that one would easily come to the conclusion from the writings of Mayo that he was a firm believer that the parathyroid glands had control of the calcium salts while they were in the circulation, but that the thyroid glands had the fixation of these lime salts.

Rolliston-Whitaker and Waller are both of the opinion that adenoids and enlarged tonsils are not a disease, but a sympathetic enlargement to assist the thyroid, and as soon as the thyroid is able to secrete sufficient for the system the tonsils and adenoids disappear.

It might be of interest to know that dogs born in many of the Middle States are practically all afflicted with goiter, and that the sheep of the State of Michigan in some years are badly afflicted with cretinism.

In closing let me say right here that I think that we as dentists have here, in the field of the thyroid gland, the greatest opportunity for work and the most fruitful field for investigation; and, this work must be done by you, gentlemen.

REPORT OF THE DISPENSARY COMMITTEE¹**MASSACHUSETTS DENTAL SOCIETY**

Last year the Dispensary Committee gave a brief historical survey of the antecedents of dispensary work in Massachusetts and of the establishment of dental dispensaries, the earliest of which date from the winter and spring of 1910. A short account was given of the dispensaries in the Massachusetts General, the Waltham Hospital, and the Memorial Hospital in Worcester; of seven social service dispensaries in and near Boston and of dispensary work in the schools of Somerville, Revere, Winchester, and New Bedford, with brief accounts of activity elsewhere. It is purposed in the present report to note the changes for better or worse in the dispensaries antedating May, 1911, with some account of what has been accomplished within the year. It is believed that helpful conclusions may be drawn from this review.

No marked change has taken place in the efficiency of the dispensaries in the three hospitals just mentioned, except that it is planned to add to the equipment and working force at the Massachusetts General Hospital Clinic, and that a reduction from four to three has been made in the open days at Waltham with a corresponding loss in the number of dentists attending. The work at Memorial Hospital, Worcester, moves steadily on. There is no lack of financial support, and, what is far more important, the number of dentists from which to draw recruits to take the place of those who step out is large.

At least one hospital dental dispensary has been started during the past year; this is at Grace Hospital, Kingston Street, Boston. The clinic resembles that at the Massachusetts General, except that as yet it is not so fully developed, and the oral surgery does not form a separate department.

The management of the Homeopathic Hospital on East Concord Street, Boston, is ready to establish a dispensary when workers can be found.

Turning to the social service dispensaries, the changes are

¹ Read before the Mass. Dental Society at its 48th Annual Meeting, May 2, 1912, at the Harvard Dental School.

found to be more numerous and more vital. The work at the Boston Dispensary is so well established that no change is likely except for the better. On the other hand, the Berkeley Dispensary is crippled for lack of helpers. At present two men give their services with the burden mainly upon one of them. The authorities in charge would gladly increase the equipment if only workers could be secured. The Dispensary is open Tuesday and Friday from 10.30 to 12, but it is difficult to compress the work within these limits. The service which has been offered at Anderson Street has been transferred to 140 Mt. Vernon Street, but beyond this fact little can be reported. Work at the North End Dispensary has been discontinued, but partly to take its place a dental dispensary has been opened at the Hull Street Dispensary, with the Metropolitan Dental Hospital Association in charge. About twenty members of the association are accepting appointments. Ten dentists are at present giving their services at the Lynn Dispensary. This portion of the beneficent work of Neighborhood House is open to the school children every afternoon; it is privately supported, the charge covering only the cost of materials. There has been no falling off in the service for the Martin Luther Orphan House at West Roxbury. Forty-six inmates have been cared for during the year. Last year the authorities in charge felt that the remarkable health of the children was due in no small degree to dental oversight. Not a child has been sick during the past year, and only \$2.77 has been spent for medicine.

An evening clinic started during the past winter at the Harvard Dental School, is more than an equivalent for certain losses in services elsewhere, in that a need has been supplied which has not been met by any other clinic. Only one other report of an evening clinic has come to the Dispensary Committee. It may not be out of place to mention that the increase in the number of students at the dental schools has rendered possible a wider distribution of the incidental service of these institutions.

Lastly, may be brought to mind the rising walls of the Forsyth Dental Infirmary for Children, where, before another May comes round, a work of health and healing will have been inaugurated.

The school dispensaries and the dispensary work at Somer-

ville, Revere, New Bedford, and Winchester have felt, as a whole, a slight falling off in service during the year, but there have been counterbalancing gains. At Somerville a woman assistant has been attached to the dispensary, which promises greater efficiency in many ways. Tooth brushes and tooth powder have been sold at cost. No change in the dental work is noted at Winchester, except that a little closer attention has been given to the teeth than has been possible heretofore. Tooth brushes have been supplied to the school children at cost. During the year all the pupils in the schools (1,411) have had their teeth examined, and 122 have been treated by the several dentists at a nominal charge. The income from a local fund is now available, where parents cannot afford to pay the amount required for extensive dental treatment. At Revere the number of dispensary workers has been increased by one. What is true of this dispensary is true of others, that a vital interest in the work is not felt by all the workers, or not so felt as to result in constancy of service or an equal division of the burden. The school physician reports the mouths of the children to be in much better condition than last year or the year before. In 1910-1911 the dispensary was open 31 afternoons and 160 treatments were given. The dispensary at New Bedford, started a little more than a year ago, continues its efficient work along the lines described in last year's report. The following is quoted from a recent account of the work: "Every dentist is giving his time who went into the work at the start. The city appropriates funds for maintenance. We hope this is but the beginning of what the work will develop into."

Reports of dispensaries starting during the year have come from Cambridge, Provincetown, and Sharon, and of dispensaries about to open, from Lowell and Chelsea. Through the aid of a dental committee, a dispensary was established in Cambridge in February, 1912, and opened at the Wellington School. The equipment and the sustaining funds come from private subscription. Twelve dentists render service, two working in conjunction. Pupils in the elementary schools are eligible, and the selection is made by dentists and principals of the schools. There is no nurse, and as yet there is no extracting. When parents can afford it, a small fee is charged to pay for the expense of materials.

The dispensary in Provincetown is open every Saturday with two dentists in attendance. The teacher and school physician select the cases. The work is supported by the fees, which are half the regular fees. It is estimated that one hundred children have been treated.

The work at Sharon, which was established by the School Committee, is exceptional, in that it is conducted in the evening. One dentist is in attendance. Teachers make a selection of cases from children in the grammar schools. The work is supported by fees which are from ten to twenty-five cents.

In Lowell the School Committee has voted to open a dispensary, and an unused schoolroom is to be fitted up for the purpose. An appropriation of \$900 has been made for an equipment, and the dental society of the city has passed a vote offering services.

A room has been selected for a dispensary in the Williams School Building, Chelsea. The aldermen have appropriated \$450 for an equipment, and the School Board will pay the cost of materials. The dispensary will be open Tuesday and Thursday afternoons during the school year. Ten dentists have promised service. There will be no charge to pupils.

Each of the seven dentists in Dedham devotes one-half day a month to dental service for the children in the schools. The selection of cases is made by a school nurse. The plan was started in January, 1911.

To the foregoing accounts of dispensaries, many notes of progress might be added. Some of them are embodied in reports to the Dispensary Committee, others gleaned from miscellaneous sources. In Boston, for example, an important forward movement in dental hygiene and preventive dentistry as applied to schools is in progress. The vote embodying the new provisions was passed as recently as April 15. The subjects both of education and treatment are set forth in a document so carefully prepared, so complete in understanding and so wide in scope that no forward looking dentist who wishes to be conversant with the best which has been thought out in this department of dental hygiene can afford to leave it unread. This movement follows an extensive and thorough examination of the teeth of the school children during the past winter. No school dispensaries will be

started, for reliance will be placed on existing helps, but in other ways it seems likely that all will be done which can be done.

Brookline continues in the front rank in the study and practical working out of dental problems as applied to schools. By the aid of funds, privately collected, needy school children are cared for in the offices of the dentists, the compensation for the service being one-half an average dental charge.

The work of examining the teeth of the children in the town of Norwood was begun by the school nurse last spring (1911), and before the close of the school year 1,296 children had been examined, 827 of whom were found to have defective teeth. Ninety-three children consulted a dentist as a result of the examination. In the fall and winter six local dentists thoroughly examined the teeth of 840 children. As a result many children received treatment.

In Ludlow an arrangement with the local dentists for a reduction of 25 per cent. in charges, following an examination of the teeth of the children and a recommendation to parents, is stated to have had very little result.

The report of the local dentist who made examination in the town of Medway contains the following: "Generally speaking, the results of my inspection bear out the usual findings of dental examiners in the schools—namely, that a big percentage of the pupils have defective teeth and unclean mouths. Many children make no attempt at cleaning the teeth. Many have no tooth brush, and many who have one seldom use it. In one room all but half a dozen pupils suffered more or less with toothache. That these children can do their best work or attain even 50 per cent. of their normal ability is impossible. If parents and guardians really knew how much an unclean mouth and defective teeth contributed as a causative factor in producing various physical and mental disorders, how much it contributed to susceptibility to contagion in many epidemics, and how it interfered with the mental development, there would be less or no neglect evident in the mouths of our children."

By an arrangement between the school authorities and dentists in Canton, Marblehead, and Easthampton, school children receive treatment for a normal charge or without charge.

The charitable work in Springfield was referred to in last year's report.

From the reports which have come in from different parts of the State, and especially from the facts already given in this report, it is not difficult to summarize and draw conclusions. The greater number of cities and towns throughout the State have no dental inspection in the schools. Where there is inspection it is usually conducted by the school physician in connection with medical inspection. Not that inspection is necessary to the starting of a dispensary (dispensaries have been started without it), but where there is inspection by dentists it usually indicates antecedent interest, and is more likely to lead to an awakening which will insure practical results.

That these dispensaries are all located east of Worcester, and three-fourths in the greater Boston district is a fact that may well challenge attention, and a study of the conditions might prove instructive.

An encouraging sign of the times is found in the greater reliance which is being placed on a woman helper in dental inspection and in connection with the dispensaries. The following rules taken from the new dental code of the Boston School Committee indicate the importance of the nurse: "The methods of bringing these principles home to parents and pupils should include teaching and reiteration of these principles (of dental hygiene) by teachers to the children and an explanation by nurses to the parents." "Frequent physical examinations of the children's teeth by nurses and teachers to see whether they are clean." "The use of the tooth brush should be taught in the home by the nurse or kindergartner so far as the ground can be covered by the present force."

To any one familiar with the working of a school dispensary where accurate records are kept, a charge made for service, tooth brushes and tooth powder distributed, and a definite and constant help given to the operators, it would seem little exaggeration to state that a woman assistant would double the amount of good which might be accomplished.

Another encouragement appears in the greater willingness of cities and towns to grant financial aid. Too much reliance should not be placed upon the three or four instances of this kind, though it is hardly likely that the movement will halt where it is.

After all the great factor is the dentist himself. That he has lost heart somewhat under the pressure of an unpaid service, in conditions more or less unsatisfactory and trying, is not surprising; rather is it not surprising that he has become so little disheartened? Most dental offices are conveniently arranged. The dispensary is often inconvenient in arrangement or at least practically so, as nothing is in a place where the operator expects to find it. Then there is the lack of standardized methods, of customary materials, instruments, and appliances. Under these conditions there is the discouragement of feeling that one has not accomplished more than half what might be expected. Furthermore, in one instance at least the dispensary was sought by patients well able to pay a full fee, with the result that there was a falling off in the number of workers. The remedy for this evil was found, though almost too late, by careful investigation in the homes of the children by the school nurse and in an increase in charges.

All the difficulties or a large proportion of them are remediable, and it is the work in spite of the difficulties that is the important question. In this work dentists have found a satisfaction they had not counted upon; the satisfaction of joining hands with fellow workers in a good cause, of looking out in a new way beyond the boundary of personal interests and of feeling the solidarity of the great army of social workers everywhere.

The benefits resulting from the dispensary are not easily overestimated. First and foremost, there is help to the patient in many ways. The dentist finds a stimulus to his finer nature; schools are rendered more efficient, with a tendency toward a reduction in the cost of maintenance; and as a dispensary tends to reduce the amount of sickness, it becomes a public economy in every community where it is located. Its extension is a sign of increasing interest in social betterment.

Respectfully submitted,

HENRY H. PIPER, D.D.S., D.M.D.,

Chairman of Dispensaries Committee of Massachusetts Dental Society.

A METHOD OF TEACHING DENTAL HYGIENE BY STEREOPTICON¹

BY WM. H. POTTER, A.B., D.M.D., BOSTON, MASS.

I wish to give a talk in regard to the principles I use in teaching children. It is advisable first of all to show children what we are talking about. The slide I will show first is a copy of a specimen in a medical museum. I explain in a rough way the characteristics of the temporary teeth. I show how the front teeth are made for cutting and the back teeth for grinding. I tell the necessity of the care of the temporary teeth. If this is neglected the physical condition of the child will suffer.

Next, I show a slide of the permanent teeth. This I have used for several years, and it shows the differences in size and number between the permanent and temporary teeth. The size of the crowns and the roots of the teeth impresses upon the children that the teeth are intended for strong physical work. The next slide shows the eruption of the six-year molars and the eruption of the other teeth, and it gives an idea to the children of how their temporary teeth come in and how their permanent teeth come in behind. In order to give some of them an idea of the forces which destroy the teeth I took an impression of my mouth. I tried to illustrate to them the mouth of a child twelve years of age. I tried to illustrate that deposits of food are the greatest cause of decay by putting wax between the teeth, and telling them that this was where food lodges. The next model shows the places where the lodgment of food occurs on the external surfaces. I explain to the children that where food has been allowed to stay is where trouble begins. Here you see a model showing the cavities constantly growing larger. Here is shown the destruction of the molar. I say to the children that when a mouth gets in that condition it is a source of great pain and discomfort to the child, and besides that, it furnishes a place for accumulation of decomposing food in the mouth. Here are shown the models of an upper and under, demonstrating how the sixth-year molars, if decayed, are a source of development of

¹ Read before the Mass. Dental Society, May 2-4, Boston, Mass.

harmful bacteria in the large cavernous spaces especially after decay is great. Here is a model of my own mouth. It is an effective piece of mechanism which is to be kept reasonably clean and is a source of comfort to the owner. The teeth meet in a proper way, insuring that scissors-like cutting of food. Now, I am showing a very bad case with which some of us are familiar. Dr. Woodbury said that the mouth was renewed and made clean by restoration to function. It was a very evident impoverishment in the child's physical condition. In fact, it was the most obvious trouble that the child had.

Here is a model of the upper jaw showing the shells of the sixth-year molars, which I compare to full garbage pails, except that the garbage pails are in better condition than these molars. I often say that I have seen in the Brookline schools just as bad a mouth.

It is well occasionally to bring in something that is not too serious. Here is a picture of a dog in physical pain from toothache. It shows in a humorous way that children cannot study while in dental pain.

Here are some printed directions for use in the Brookline schools:

1. The teeth should be thoroughly brushed after each meal.
2. A tooth powder used on the brush helps to clean the teeth.
3. Candy and crackers should not be eaten between meals, as they cause the teeth to decay.
4. The slow and thorough chewing of hard foods helps to preserve the teeth and keep the mouth in a healthy condition.
5. Children's teeth should be examined by a dentist twice a year.

In lecturing to the children I amplify each rule. Then I show brushes, floss silk, and tooth powder. I then give the formula of a good tooth powder. Then I have a slide showing a child after cookies at eleven o'clock. I tell them that the eleven o'clock habit of getting cookies and candies is pernicious. Here is a picture of a child taking a stick of candy. That is a harmful practice. The keeping of sugar about the teeth for hours together is sure to cause decay.

Then I show a slide that might be pasted in a book to show what should be.

The ideal place for the school dental clinic is in the school building. Here is a slide showing one in Berndorf, illustrating the model school clinic. Here are the furnishings, the operator and the school nurse. There is a suite of five rooms, including an extracting room, the room for mouth and dental operations, etc. Here is another slide showing an up-to-date extracting room.

Dr. E. H. Smith.—This has been a very interesting presentation of the subject.

Dr. A. Harriman St. C. Chase.—I would like to speak of the great value of these slides which Dr. Potter has and of the pictures which Dr. Potter has in his office. I have had occasion to borrow these charts six or eight times for use in Everett. The ladies have got ten into the schools. The ladies' clubs have everything which prevails to build up the health of the children. I have also used the slides at the high school before the grammar school children. The Colgate Company has offered to supply tooth powder gratis. In one school the principal offered prizes for the best essay on my lecture. The children took a great deal of interest and were very attentive. The amount of good thus done in the schools is surprising. If each dentist would interest himself he would do a great deal to help the children to have clean, healthy mouths.

Dr. E. H. Smith.—In the early part of the winter I was called up by three boys from the North End schools to ask to have some one come down to the school and give a lecture on the care of the teeth. I sent Dr. Potter, and he gave an illustrated talk, which was much appreciated.

REPORTS OF SOCIETY MEETINGS

FIRST DISTRICT DENTAL SOCIETY OF THE STATE OF NEW YORK

A regular meeting of the First District Dental Society of the State of New York was held on Monday evening, February 5, 1912, at the Academy of Medicine, No. 17 West Forty-third Street, New York City.

The President, Dr. W. W. Walker, occupied the chair and called the meeting to order.

The paper of the evening was read by Dr. F. Ewing Roach, of Chicago. The paper was illustrated by lantern slides. (This paper is printed in full at page 304 of the present issue of THE JOURNAL.)

Discussion.

Dr. F. T. Van Woert—It has been a very great pleasure for me to be present and listen to so excellent a paper from the pen of so noted and able an author. It is an evidence of his usual careful and scientific investigation. At the same time, it is equally strong evidence that the subject is only in its infancy and will require a great deal more of careful investigation to bring it to anything like the perfection for its adoption in general prosthetic work. It is unfortunate that many members accept the deductions of prominent writers and make no allowance for the application to their individual cases, which results often in failure, and condemnation of the method, followed by loss of faith in the author. This condition is frequently brought about by the author himself, in his effort to meet the demands of the varying conditions of the members, rather than that of the subject to whom the art is to be applied. For example, the present author condemns in the early part of his paper the use of scrap gold for casting and later admits that it may be used. (I have a suspicion that he has made the admission to accommodate a few who think they cannot afford the refined gold and its proper alloy.) Within a few days my attention has been called to a case of this kind by one of my confreres in Brooklyn, who condemned the whole process of casting

on the very grounds mentioned, and all because of a misinterpretation of what someone had said in the past. My personal clinical experience leads me to believe that either pure gold or a known alloy of the same must be used to obtain satisfactory results. Surely a conglomeration of metals is not to be depended upon, hence should never be used. It is false economy and is sure to cost more in the end than the most expensive material indicated.

CAST BASE FOR PORCELAIN CROWNS—The cast base as advocated for the anterior teeth crowns is without doubt a great advance in the protection of the root; other than this, little can be said in its favor. Its greatest disadvantage is the difficulty of repair of the porcelain in case of fracture, due to the fact that there are no two crowns from the same mold that are of the same size. This variation in size is due to the unequal pressure under which they are made; therefore, I prefer the hand carved porcelain crown fused on a thin platinum base.

RICHMOND CROWN—In the Richmond crown very little if anything is to be gained in the casting process, unless said crown is to be used as an abutment for a bridge. In fact, the cases are rare in which the Richmond crown should be used for any other purpose.

GOLD CROWNS—I am not quite in accord with the author's technique of making all-gold crowns. First, I find that a short band, say, not more than one-half, preferably less, of the length or height of the crown, permits of the restoration of contour in the wax with more accuracy and in less time. At the present time I know of no argument to combat this, unless possibly it be the claim that an excess of gold is used. This is very easily overcome with the Roach Suction Carver; but a gold crown constructed in either way comes nearer the ideal than anything ever presented before, provided proper gold is used. I have found Ney's gold 22-k. non-oxidized best for the purpose. Sweating the band and using gold that has not been melted more than two or three times is best.

CAST BRIDGES—My early experience in this work was rather a sad one. Later, I found by reinforcing with iridio-platinum, as suggested by the author, eminently satisfactory results were obtained; but I feel very much more secure when the union between

two or more dummies is strengthened with solder. I do not believe in anchoring bridges to inlays. It seems to me a very impracticable method.

CAST DENTURES—In this I think I have as varied and extensive an experience as almost anyone, unless it is Dr. Taggart, and I find the results far from satisfactory. There is little difficulty in casting a plate, including the clasps, that will fit, and be of an even and suitable thickness; but I have yet to find an alloyed gold which will stand the strain in the average case. There are few cases where the occlusion and formation of the remaining natural teeth are favorable to such a fixture. I mention one case in particular which many of you have seen. A maid in my office wears a cast upper plate of clasp metal and clasped to the third molar on either side, the crowns of which are conical rather than bell shape, so that there is little springing of the clasps and the occlusion is directly upon the ridge posterior of the six front teeth, so there is little or no strain upon the plate, otherwise it would have been broken long ago.

From what I have said it might be inferred that I am depreciating the casting process, but this is furthest from my thoughts. On the contrary, it is to enhance its value and help to bring it into more general use that I have pointed out some of the difficulties which have prejudiced some against it, and to show my appreciation of the great genius, Dr. Taggart, who has given us this most wonderful discovery, and by getting the good and practical results out of it and not making it a farce by a lot of failures.

Dr. Charles F. Ash—I want to say I take off my hat to the gentleman from the West. In the East, we are only beginning to wake up to the possibilities of this work.

There are a few things in the essayist's paper with which I must differ. I noticed in reading a synopsis of his paper that he said he was surprised to see people still fitting bands, and then he said something to the effect that he was condoning the offence. He has no right to condone the offence. A very strong stand on that point should be taken by every essayist who reads a paper before a dental society on this subject. I do not believe bands have any place in the mouth in the ordinary prosthetic procedure. Something very extraordinary may make it permissible, but I cannot think of any such condition at present.

The essayist also made the remark that he found in making

splints, they were apt to be weak at certain points. My own experience with the splints I have made and with all the splints I have ever seen made by anyone else is that they are unnecessarily strong and altogether too bulky. They do not require any great amount of strength to hold the teeth in proper position. I will not dwell on the technique of this work, but simply go hurriedly through a few points.

One point with which I take exception is in regard to the use of scrap gold. No scrap gold should be used in any casting, and no base metal should be used in casting any sort of prosthetic piece.

Another point with which I take exception is in regard to indiscriminate use of inlays as abutments for bridges. I feel, from my own experience, as does Dr. Van Woert, that any bridge carrying more than one dummy, requires more than an inlay to hold it.

In regard to the preparation of the root, I also think that the preparation which most of you know I have advocated for many years is a little more capable of being made positive at the margins. I know it has been criticised by some people, especially by our friend Dr. Chayes, and he will give you some geometry to prove that it is a wrong preparation. The preparation which I advocate is the grinding down to the gingival margin and enlarging the circumference around the post hole. After the preparation is finished there is considerable room around the pin below the surface of the root.

The bridge which was shown on the screen with the hand rail attachment appeals to me as being very unique and clever. He attached a piece of iridio-platinum by extending beyond the line of the cusps. I have frequently incorporated a piece of iridio-platinum in the attachment, but this is entirely new to me and very clever.

Another point is in regard to the cast crown, but inasmuch as the gentleman who, I think, originated the cast gold crown on a platinum shell is to follow me, I feel it is within his province to speak of how to make the cast gold crown.

Dr. Herman E. S. Chayes—I want to say at the outset that I fully appreciate the skill and the knowledge of the essayist, more so now that I have had the opportunity to see his work and listen

to his paper. I agree with him that the profession in general has not made the most of this wonderful process invented by Dr. Taggart. But I do not agree with him when he says that, from a scientific point of view, the subject of dental castings has been thoroughly covered, and further states that the behavior and the manipulation of waxes has been so thoroughly discussed that it is now well understood.

There is no doubt at all that prosthodontic restorations can be more accurately and more artistically made by means of the casting process than by any other method. Whether they can be made in shorter time is no important question. I do not believe they can.

However, the results one obtains are so superior to the old method results that we do not begrudge the additional time it may take.

The real truths about casting, propounded by Dr. Taggart and unquestionably best known to him, have been obscured and blurred and distorted for the majority of the dental profession.

They have been induced to follow erroneous teachings of thieving manufacturers, who attempted not only to discredit the father of this process, but actually made capital out of the credulity of the majority of the dentists.

Two factors enter into the wherefore of this situation. First, our so-called superior business methods of America make it possible for one man to invent a useful process and for his rapacious neighbor to reap a harvest of unearned benefits therefrom, and, second, the unreasonable desire of the average man to obtain something for next to nothing makes him a ready prey for the methods of the same rapacious neighbor.

The men who to-day really know something of casting are using the Taggart machine and the Taggart method, but how many are there in number?

The vast majority are using spurious machines and spurious methods; both the machines and the methods are wrong in principle of construction and hence in results obtained. How, then, can we say that from a scientific view the subject of casting has been well covered and is well understood?

Probably the propounder of every great truth has had the same things to contend with, and in a measure it is a sort of acid test of the real value of an idea.

In time to come casting will be understood and practised along scientific lines. Until that time comes a vast majority of dentists will have been duped and the great mass of the public will have been imposed upon, but he, the vulture and the rapacious neighbor, will have enriched himself at their expense and at Dr. Taggart's expense.

I have had the use of nearly every machine brought out for dental castings, and the process itself has conjured up a great many problems for me, and the result of the experiment in that line may be summed up as follows:

(1) It is impossible to do proper crown and bridge work unless you use the casting process.

(2) Far from reducing the need of digital dexterity, it calls forth every artistic tendency which may lie dormant in the student.

(3) It makes possible, as nothing else can, the anatomically correct restorations of lost dental organs.

(4) It will in time bring to the dentist a desire for and a knowledge of things that are beautiful in his work.

(5) It will be the cause of bringing to us a great many new and better alloys of the royal metals and, incidentally, will increase our knowledge of metallurgy.

And here are a few simple rules which, if you have a Taggart machine, will aid you to obtain nearly perfect results:

(1) Put your sprue wire into the thickest part of the wax inlay.

(2) Be sure your investment has been mixed according to directions and measurements, and be sure that you have carefully covered your wax model before filling the flask.

(3) Be sure your investment is hard before you remove your sprue former.

(4) Be sure that the heat you apply to destroy your wax model is a very gradually increasing one, and be sure you have destroyed every vestige of it before you remove the flask from the flame.

(5) Allow the flask to become stone cold before you place it upon the seat of the machine.

(6) Be sure the holes in your plunger head are not stopped up, and open your nitrous-oxide valve to its full extent.

(7) Use only clean metals for casting. Bring them to a

melting point as quickly as possible, continue the heat until the mass boils, then bring the plunger down as rapidly as you can, for upon this depends the instantaneous casting. And only these castings are nearly perfect.

(8) In casting large saddles, insert the sprue wire not at right angles to the piece but at an oblique angle, and the greater the oblique angle, the more chance of obtaining a perfect casting.

Remember that casting at right angles you are forcing the metal into 360 radii of a circle, and that the result will be successful in proportion to the direction, torsion and undulation of the radii.

(9) Cast individual inlays in pure gold containing 5 per cent. platinum. You will get sharper castings and they will not flow under stress of mastication.

(10) Inlays to be used as abutments should contain at least 10 per cent., better 15 per cent., of platinum, which in turn should contain 10 per cent. of iridium.

(11) If you are doing extensive saddle casting, your alloy should contain 19 per cent. iridio-platinum, 6 per cent. of silver, and 5 per cent. of copper. This will give you a spring alloy you may cast several times without losing its virtue.

(12) In preparing a cavity for an abutment inlay, be sure that your occluso-cavico surface is at acute angles with your disto or mesio cavico surface. This simple precaution will take the place of supplemental pin anchorage and will not weaken the tooth.

I do not agree with the essayist's method of root preparation. The method he advocates does not, to my mind, best conserve the root. I prepare mine with a bevel of varying degree, so that the cast piece grasps and holds the root around its external circumference, and this effectually prevents splitting and rotation.

I want to commend the essayist's ingenious technique for restoring to usefulness roots that have split. It seems to be the best method ever devised for this sort of work.

Again I wish to extend my sincere thanks to Dr. Roach for his very comprehensive paper.

Dr. J. E. Nyman, of Chicago—A good deal of the discussion to-night reminded me of a discussion I once heard in the House of Lords in England. I was privileged to hear there a very scholarly and very learned gentleman, who spoke somewhat as

follows: "I wish to make a most deliberate and emphatic statement. However, I reserve to myself the privilege of refusing to interpret this statement and also refusing to accept the responsibility of any other gentleman's interpretation of this statement, either at this time or any other time."

I cannot do more than pay a tribute to what I know of the genius and operative skill of the essayist of this evening. I might reassure one or two of the gentlemen who were a little skeptical as to the splints. I am fortunate in having as associates Dr. Orr and Dr. Bryan, who made these devices. I have seen Dr. Orr construct three splints similar to that, and set them successfully in the mouth. It requires almost infinite patience and infinite skill.

Dr. Nelson T. Shields—I thank you very much for the privilege of discussing Dr. Roach's paper.

The paper bears a very close relation to the last paper Dr. S. G. Perry wrote and read before this Society this winter. Dr. Perry always had the good of the profession at heart, and that fact alone will give Dr. Roach's paper strong endorsement. I regret the paper does not describe a crown whereby an entire upper or lower denture could be restored. In this strenuous age any crown should embody not only strength within itself, but should be so constructed that many crowns could be soldered together and contoured perfectly for the restoration of the many cases you meet in private practice.

The inferior splint, as shown on the screen, is evidently constructed on teeth with pulps alive and the teeth quite extensively mutilated. This manner of splinting I am absolutely opposed to, for the definite reason that the comfort of the patient will be very temporary on account of the calcification of odontoblasts at the points nearest the irritation throughout the dental pulps. To extirpate these pulps in the beginning and fill the roots on scientific lines, and construct a splint without mutilating the contour of the labial surfaces, positively anchoring the splint in the pulp canals, and so contoured at the cervical margin that the hygiene of the mouth can be easily maintained, are the lines on which such a splint would be constructed in my hands. In reference to setting the pivot in the posterior root of the lower bridge, as shown upon the screen, the bridge would be infinitely better constructed

to have the pivot inclined forward, being anchored in the anterior root and soldered to the posterior grinding surface at the time the crown was made, and straightening the anterior wall of the natural tooth. All bridge work abutments should be anchored positively. The extirpation of pulps and anchoring gold inlays with pivots into the roots is a practice which has been successfully carried on by me for twenty years, and was made known by me before this Society at least fifteen years ago. Furthermore, I have stated before this Society, and to the best of my knowledge, I am the first to have stated, that no abutment should be constructed for a bridge or permanent splint without having first extirpated the dental pulp, and fortunately many have realized the truth of my clinical experience. If Dr. Van Woert would construct his inlays for abutments in this manner he would have no trouble; my long experience has taught me that this class of workmanship is absolutely beyond any experimental stage.

In reference to Dr. Ash's remark on needless strength for splints, I would like to state that a great deal more strength is necessary for the retention of loose teeth than teeth that are not loose. The greatest possible strength should be employed in selecting suitable metals such as platinum and iridium, and half round clasp metal between stays, which, when soldered, will give the greatest strength within the smallest space.

I very much enjoyed Dr. Roach's paper, but there is nothing new in it. The repetition of facts, however, is desirable.

Closing Discussion.

Dr. Roach—I am surprised Dr. Van Woert did not disagree with me at all. He appeared all the time to be disagreeing with me, and yet at the same time I believe he corroborated my position absolutely. I am very emphatic in regard to the use of junk gold. Better not use it at all, unless for the cusps of the gold crown.

The claim has been made that these all-gold crowns are too expensive, on account of the greater amount of material used in their construction, but as Dr. Chayes and others have said, we should not let this influence us in our choice of the procedure best suited to the case.

With regard to the repair of the cast base crown, how will Van Woert repair his crowns? I claim this is just as easily re-

paired as Dr. Van Woert's crown or any other crown. I admit the crowns are not exact duplicates in each case, but I can grind them and I can prove that they are sufficiently accurate. I never have had to repair one, as a matter of fact. I believe they are the strongest crowns I have ever made, and I believe they are the strongest that can be made. I believe the repair can be made more easily and with more accuracy than any other crown I have any knowledge of, so I think the repair feature of it is certainly in favor of the cast base form of construction.

I made the statement that I do not advocate the use of bands as a rule. I prefer the crown without a band in most individual crown work, but for bridge abutments the band is usually employed.

I called particular attention to the lack of tensile strength and elasticity in castings, and emphasized the necessity for iridio-platinum reinforcements.

I also tried to make clear that inlays as abutments for bridges should be used very cautiously. I believe that inlays may be used advantageously for bridge abutments where sufficient supplemental pin anchorage is employed.

I agree absolutely with Dr. Van Woert in regard to clasps. I think the cast clasp has no place in practise at all. The material has no tensile strength, and is brittle, and has no spring in it. I made some and they invariably broke, so that I do not recommend casting for clasps.

Dr. Ash stated that I spoke of using junk gold. I omitted the part that it might be permissible to use it in the casting of the occlusal surface of the gold crown, and that would be the only place.

Dr. Ash—And that would be only in case you had nothing else in the office?

Dr. Roach—Yes. While Dr. Chayes disagreed with the substance of my paper in many respects, I do not see wherein there is any great amount of difference between his idea of constructing the crown, and mine, because he speaks of the elimination of the band, or, rather, he does not favor it, and he proceeds with a particular method that he has found satisfactory to him.

Gentlemen, I hope I do not appear to be dogmatic. It was not my intention to be so. I merely give you these ideas as a way

these different pieces of work may be done. You can adapt the principle to your various uses. The personal equation enters into every operation, of course. It is the principle.

I would like to bring to your notice what in my opinion has been a deficiency with reference to the use of casting in prosthetic work.

As Dr. Van Woert stated, this is merely in its infancy, but I feel I have gotten a little beyond the infant stage with this process, and I know I am getting results that I never could get with the old swaging process. I believe it is a question of acquiring the technique and understanding the difference in the physical properties of cast metals, and that of drawn and rolled metals, and adapting the two metals individually, and in combination, to meet the requirements. That, it seems to me, is all there is to it.

There is no question of the greater adaptability of wax over gold, and the cast metal has not only shortened my work and my methods, but has given me better results in almost every instance.

Mr. President, I thank you for your patience in listening to what has been rather a tedious evening in trying to cover too much ground, and possibly not confining myself to fewer methods instead of trying to give so much.

A hearty vote of thanks was tendered to Dr. Roach for his excellent paper.

Adjournment.

FREDERICK C. KEMPLE, D.D.S.,
Ed. First District Dental Society.

MASSACHUSETTS DENTAL SOCIETY

Discussion of Dr. W. T. Reeves's paper, "Some Methods that Lead to Failure in Porcelain Inlays and their Correction." (Dr. Reeves's paper is printed in full at p. 219, June issue of *THE JOURNAL*.)

Dr. Amos I. Hadley.—There are a few points that ought to be repeated. The sentence that the operator used fifteen years ago was that the use of Porcelain is limited only by the ability of the operator. The illustrations used by the essayist ought to convince every one of the excellent points that he sought to bring out. As for adaptation, the minimum of cement means adaptation. In the method used by the essayist in making the matrix, it seems to me that the weak point is at the cervical margin. As he says, the shrinkage is in the direction of the least resistance, and hence there would be shrinkage at the cervical margin. With the indirect method you can get plenty of platinum everywhere, even at the cervical margins. I hope every one will read and re-read this paper, especially about the color problem. If we would give more time and thought to the fusing of the porcelain we would have less weak porcelain. We ought to have more than a speaking acquaintance with the furnace, and we ought to learn how to handle it. I want to congratulate the essayist upon this paper, and hope it will stimulate the further use of porcelain. I would like to ask Dr. Reeves if he uses the same color of cement for all his inlays.

Dr. Reeves.—I use only one color. My observation shows me that in those inlays that were so extremely blue or brown or gray, and I used a different color of cement, the color of the cement changed after a while and became a neutral gray. I use a bluish white.

Dr. Julius F. Hovestadt.—I think the message of Dr. Reeves cannot be fully appreciated until we see him work. The modesty of Dr. Reeves is known to his friends, and I want to say that you have a treat before you to-morrow. Dr. Reeves has been doing porcelain work for fifteen years, and he is more enthusiastic now than ever before. He is getting back at some of his friends who doubted him before. His paper demonstrates the pointers which he passed on to me, especially the importance of

the large amount of platinum used in the matrix. I want publicly to thank Dr. Reeves for saving me a great deal of trouble in porcelain work caused by not having the inlays fit. Plenty of platinum solved the trouble I was not able to locate. It is an important thing. Many of my colleagues do not appreciate the importance of the points brought out.

It is very important to confine the work to light colors. The average man goes far astray in trying to find himself among all the colors. I think Dr. Reeves uses less than eight in the great bulk of his work. It is wonderful the results he gets with two or three or four colors. You gentlemen will find it exceedingly profitable to observe the many details which can be appreciated by seeing the man operate. The paper was not long enough. I advise the men to heed it at this time and at the clinic.

In cementing, Dr. Reeves speaks of the color problem. It is very vital in porcelain work. I think Dr. Reeves will agree with me on the very great importance of getting a sizable mix and at the right consistency. Make the mix pretty thin; in fact, make it thinner than that. Many inlays are not successful because of the cement being too thick in setting the inlay. Use the cement thin. There is a certain knack which comes to you at such a time, and I know that Dr. Reeves has thoroughly mastered it. The selection of colors is an art in itself. I feel that Dr. Reeves neglected that important part. Dr. Reeves is an artist in the selection of his colors. There are many things that I wish he would tell us which are absolutely necessary for the success of a man in porcelain work. I believe that porcelain today is on a more solid basis than ever before. In Germany the past summer it was my pleasure to see a lot of porcelain work being done and much enthusiasm being shown. Porcelain is only limited by the man himself. The people are learning to know that such a thing is possible. There are many good men who are delivering the goods in porcelain. The next ten years will see porcelain in its proper place. One must master it in its intricate details. The Society has been especially favored in having Dr. Reeves here. We have a subject in which I hope every man will be interested to the fullest extent possible.

Dr. Walter I. Brigham.—Will Dr. Reeves give us a little more in detail his cavity preparation? I believe that in cavity preparation lies the success of porcelain work.

Dr. Reeves.—I will show this to-morrow. I expected to bring you one point in particular, about the baking in layers, but I left it out. I am afraid I cannot explain to you the whole subject of the cavity preparation without visible models.

Dr. Brigham.—Do you depend upon the adaptation of the cement? I claim you need mechanical preparation also.

Dr. Reeves.—I am preaching the idea that you do not need mechanical retention. I suppose that in a bicuspid cavity that you would want a groove cavity on the porcelain surface. Now, cast gold inlays have taught the profession things which are valuable in inlay work. With the form of cavity preparation which the previous speaker advocated, the cement-line can be two or three times that which mine would give. In the interlocking form of cavity preparation you would lose the accuracy of margins and have great difficulty in fitting the inlay. The retention is in proportion to the area of surface exposed to the cement and the accuracy of adaptation. Whatever the inlay, it holds until the cement line is broken. The difference in pounds pressure, between positive mechanical retention and possible freedom from mechanical retention, is so small as not to enter into consideration in inlay work. The loss of adaptation of the matrix in a complicated cavity form is greater than the gain from the increased area of the other form of preparation.

Question. Do you prefer burrs or stones?

Answer. I use stones largely, and when burrs are used I use only round ones.

Question. Did I understand you to say you beveled the edges?

Answer. I cannot tell you as well as I can show you to-morrow.

Dr. George A. Maxfield.—With many the failures have been with the edges. I find the edges of inlays chipped after a few years. I think that has been the reason why the profession almost dropped porcelain work. It seems to me that if there is a beveled edge there is more danger still of this occurring. With regard to the cement it is a law of mechanics that the least glue you use the tighter the joint. When the inlay is down in place it should set so absolutely that there is little cement. We must dry the cavity out with hot air.

Dr. Brigham.—In regard to the preparation of cavities I do not believe that it is safe to depend upon the cement to hold the inlays. Speaking of boards and glue, that is true, but our cement is more the bulk and consistency of Portland cement than glue. Our cavities should be prepared upon some mechanical lines. Dr. Reeves speaks of grooves extending the surface area to hold the filling in. That is of no account. Our porcelain fillings should enter the tooth with parallel walls, or else they should interlock themselves in some portion of the surface; then to be dislodged, the inlay must slide upon itself. I don't use a platinum matrix or a high fusing body at the present time. In filling the proximate cavities we are often able to save more of the labial than of the lingual wall. If you want to get out your matrix with much overlap you must have a large amount of separation. If we will dovetail the lingual wall just a bit no power on earth can dislodge such an inlay after cementation. In the matter of bicuspid, I would have a locking retention by grooves in the labial and lingual walls. Until I went upon the principle that I must have something more than the cement I had indifferent success. I have one patient who has at least a dozen porcelain inlays in her mouth, and they have been in at least a dozen years. In regard to the starting up of porcelain on the edges, I believe that you get a better result by having the edge just a bit below the margin of the tooth, so that the porcelain edge will not chip. In the cementing of inlays positive dryness is a great requisite. As far as the different colors go, it does not amount to much. I use a yellow cement. In the putting in of corners I depend upon lapping the back on to the labial wall. Now, in the filling of a central corner, we can cut a notch into the wall from the labial side, so that we can get mechanical retention.

Dr. Frank T. Taylor.—I want to speak of one case that came to my observation some time ago. A lady from Berlin came in with a filling in the distal surface of her right central, which had been put in twelve years ago. The cavity preparation was the simplest kind. It made me think seriously.

Dr. Brigham.—A good deal depends upon the tooth. In many pulpless teeth inlays will be retained better than in live teeth, because you can get more adequate retention.

Question. Does Dr. Reeves believe in desiccating the cavity before cementation?

Dr. Reeves.—I thank you for the kind words you have given me. I will be very glad if those interested will ask me questions at any time and at the clinic to-morrow. I do not use the rubber dam. The consistency of the cement will vary with the individual. The more quickly the operator can put the inlay in place, the more consistency can be given to the cement. I would say that all cavities should be more or less desiccated. The most important feature is that you absolutely keep out the mixture of saliva from the cavity surface next to the inlay; but in setting, cement needs a little water of crystallization to make a good crystallization. There is more loosening with the cervical margins of labial cavities than in any other place. The fact is that the largest inlays are the ones that stand the longest as far as retention is concerned. The tooth that is pulpless will retain a cervical inlay better than one with a live pulp. In the washing out of the cement by the saliva irritation is produced. The result is an exudation from the pulp which causes the filling to loosen from the walls before the cement is thoroughly hardened. Owing to the several stages of the indirect method, the inlay will not accurately fit the cavity. The direct method is the more accurate. I again thank you for your kindness.

DISCUSSION OF DR. HINMAN'S PAPER ENTITLED
"IS INLAY CASTING A FAILURE?"¹

Q. What brand of copper amalgam do you use?

Ans. Any is good.

Q. Do you use the old sprue ends, etc.?

Ans. They are melted together and afterward pickled.

Dr. Charles C. Patten.—Melt up the ends with saltpeter and borax, and you can use them to good advantage.

Dr. Charles W. Rodgers.—I am impressed with Dr. Hinman's care in details, such as having mercury in the special gold trap at the base of his cuspidor waste pipe with a clear saving of \$150 in gold per year.

Dr. Allen.—It was with great pleasure that I heard Dr. Hinman say that inlays could not be properly made by the direct method. The indirect method has taught me to be careful about cervical margins. Many times I have gone back and given renewed attention to the cervical margin of my cavity. I put pins in holes in the cavities, take impressions, and make gold inlays by the indirect method just the same.

Dr. Hinman (closing).—Dr. Rodgers referred to a gold trap. The dentists of the United States waste between three and four hundred thousand dollars' worth of gold each year. All you have to do is to put in a porcelain lined trap at the base of the rubber waste pipe from the cuspidor, and put in it several pounds of mercury. The minute particles of gold and amalgam which enter the cuspidor above are here retained. Every few months the mercury with its salvage is shipped away to a refiner and the precious metals, or their value, returned to the dentist, together with the refined mercury, which can be used over and over again.

C. EDSON ABBOTT, D.D.S.

Ed. Massachusetts Dental Society.

¹ See page 321.

AMERICAN ACADEMY OF DENTAL SCIENCE

MAY 1, 1912.

The forty-fifth annual meeting of the American Academy of Dental Science was held at Young's Hotel on Wednesday, May 1, 1912, at six o'clock p.m.

The President, Dr. Frank A. Delabarre, in the chair. The following fellows were elected to office for the ensuing year:

<i>President</i> , LAWRENCE W. BAKER, D.M.D. 12 Huntington Avenue, Boston	<i>Librarian</i> , ARTHUR H. STODDARD, D.M.D. 179 Newbury Street, Boston
<i>Vice-President</i> , ALBERT B. JEWELL, D.M.D. 429 Centre Street, Newton	<i>Editor</i> , WILLIAM RICE, D.D.S., D.M.D. 16 Arlington Street, Boston
<i>Rec. Sec.</i> , WALDO E. BOARDMAN, D.M.D. 419 Boylston Street, Boston	<i>Executive Committee</i>
<i>Cor. Sec.</i> , HARRY W. HALEY, D.M.D. 283 Dartmouth Street, Boston	GEORGE H. PAYNE, D.D.S., <i>Chairman</i> 118 Commonwealth Avenue, Boston
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	ALFRED P. ROGERS, D.D.S. 154 Newbury Street, Boston

Dinner was served at half-past six, at the close of which President Delabarre introduced the guests of fellows of the Academy, among whom were W. Parker Harrison, L.D.S., L.R.C.S., L.R.C.P., of Brighton, Eng., and Herr Tandlaege I. Ottesen, of Christiania, Norway.

He then presented the first speaker of the evening, Dr. Meyer Bloomfield, Director of "Boston Vocation Bureau," whose topic was, "Problems in the Life Careers of Our Boys and Girls."

The paper was one of absorbing interest and a full discussion followed, the privilege of the floor having been extended to the guests present.

President Delabarre then introduced as the second speaker Mr. James Nowell, of the firm of Lee, Higginson & Co., who read a paper entitled "Investments for the Professional Man." This paper contained much valuable information and was thoroughly appreciated.

President-elect Dr. Lawrence W. Baker was then escorted to the chair and presented with the gavel of the Academy by the retiring President.

WILLIAM RICE, D.M.D.
Ed. American Academy Dental Science.

THE JOURNAL OF THE ALLIED SOCIETIES

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EDITORIAL DEPARTMENT

NEARING DENTAL ANESTHESIA

"Painless Dentistry" is a phrase which probably was invented when dental operations were first attempted, and it has lived to this day as the embodiment in words of a great human need on the one hand and, upon the other, as a kind of jocular Will-o-the-wisp, not to be overtaken by man. In late years, however, encouraging progress has been made toward practicable dental anesthesia. Cataphoresis, though not immediately successful, opened a wide path for investigators; then followed "pressure anesthesia," the admixture of nitrous-oxid and oxygen, and local in-

jections of novocain and adrenalin. The "dental obtundents" put upon the market from time to time, many of them partially useful, have been innumerable.

It is an open question as to whether the dental profession deserves reproach for having moved so tardily toward this important end. The production of localized anesthesia by the penetration of dense tooth structure—in the control of, without injury to, the vital elements of the dentin—is an achievement far more difficult of compass than that of general anesthesia. It is a blessing, indeed, that relief came first and most easily for the entire body; our lesser and more intricate problem has been delayed by greater natural difficulties. But reproach will justly and speedily come in the future to operators who fail to use the means now available, and daily becoming more simple of application.

The administration of ether or chloroform for dental operations is prohibitive because of the danger, and the necessary preparation and care of the patient during each administration. The usual programme of ether anesthesia carried out through the filling of a dozen simple cavities would be a criminal absurdity. The nitrous-oxid-oxygen method has come to our help as comparatively safe and simple in those cases of extreme nervous excitability where more than localized anesthesia is needed. Jameson¹ has reported recently very gratifying results from this method.

¹ C. A. Jameson, *Progress in the Elimination of Pain in Dentistry*, THE JOURNAL, vol. VII., p. 35.

From present appearances, our ultimate success in obliterating pain during routine dental operations will lie in the simplified use of the nitrous-oxid-oxygen method, or by the control of the dental pulp by local injections which penetrate the cancellous structure of the alveolus and thence enter the circulation at the apical foramina. In all probability both methods will be considered desirable to meet varying conditions.

The work of Fischer¹, Ottesen² and others has resulted in a comparatively safe, sure and convenient technique of local anesthesia by the injection of novocain and adrenalin or suprarenin.

Three methods chiefly are used: (1) The needle is carried through the gum tissue and against the cancellous alveolar process; (2) a sensory nerve trunk is reached or approximated by the needle, passing through one of the many foramina; (3) "intra-alveolar" injection—an opening, the caliber of the needle, having been drilled through the outer plate of the alveolar process, the needle is carried deeply into that structure and near the apex of the root of the tooth to be operated upon. Dr. Ottesen's article, already noted, describes very clearly the steps to be followed.

Too great care cannot be taken in the maintenance of asepsis during every step in the use of the syringe. This is self-evident, of course; but just as the niceties of cavity preparation for inlay work have led to higher standards of care, so the necessity for a sterile field and

¹ Guido Fischer, *Local Anesthesia in Dentistry*, Translated by R. H. Riethmüller. Lea & Febiger, Philadelphia, 1912.

² T. I. Ottesen, *Local Anesthesia in Dental Surgery*. This number THE JOURNAL, p 311.

sterile instruments in this work will have a salutary influence among even our best operators. The difficulties of attaining oral asepsis during routine operations have laid dentists open to a rather sweeping indictment of negligence from physicians and from the public. This charge often is inconsiderate from a lack of knowledge on the critic's part of the mechanical and other obstacles to be overcome, and of the curious and blessed fact of comparative "mouth immunity," which shields the patient from perpetual infection in that ever-septic cavity. How many millions of open alveoli, unprotected after extraction of the teeth, heal beautifully though filled with putrescent food particles and luxuriant bacteria? What percentage of that number of such wounds, averaging three-quarters of an inch in depth, three-eighths in width, crammed with filth, in any other part of the body, would heal promptly and fill with healthy tissue? But because of this most fortunate circumstance we must not infer that the operator is excused from any care within his reach further to protect the patient from infection. The danger of oral sepsis is always present. The desirability of the best possible surgical technique is undeniable, and the imperative demand for such methods in the operations which are being considered should lead to improvements along this line in general practice.

It seems not unreasonable to believe that dental anesthesia is wholly feasible. That it will not be needed, nor advisable, in the majority of dental operations is probable; but in the future there should be little excuse for real suffering, or for poor cavity preparation—which so long has been the alternative.

NOTES ON PRACTICE

COMPILED BY WILLIAM D. TRACY, D.D.S., NEW YORK CITY

The Tongue Clamp.—There are several types of instruments made for holding down the tongue during dental operations, but probably the simplest and most universally useful device for this purpose is known as the King Tongue Depressor. It is a hinged device providing two oval metallic surfaces, one to rest under the chin, and the other to rest upon the surface of the tongue, and having a small ratchet to maintain any desired pressure.

Having an assortment of cotton rolls cut in proper lengths, it is a simple matter to place one between the cheek and the buccal surfaces of the superior molars, thus taking up the moisture from Steno's duct, another between the cheek and the buccal surfaces of the inferior molars, a short thick one under the tongue just over the sublingual glands, followed by a longer one curved around under the tongue resting against the lingual surfaces of the inferior teeth.

Now, apply the tongue depressor, placing it as far back upon the dorsum of the tongue as the anatomy of the parts, and the comfort of the patient will permit.

With the thumb under the chin and the forefinger upon the upper part of the clamp, use as much pressure as conditions will permit, being careful not to have undue strain on the floor of the mouth, and the little ratchet will hold the depressor just where it is left by the operator.

Packing the mouth in this manner permits the dentist to perform short operations on any of the lower teeth; without the necessity of using the rubber dam. This method of maintaining dryness is particularly helpful in setting crowns, or inlays, in polishing fillings, in inserting temporary stoppings, and in other instances where one needs only fifteen or twenty minutes' time. Sometimes when scaling teeth and treating pyorrhea pockets the operator is annoyed by the movements of a nervous and muscular tongue. To overcome this difficulty, fold a piece of bibulous paper several times, making a small pad suitable to lay upon the tongue and ap-

ply the depressor. While the tongue depressor, like many other appliances, is not altogether comfortable, it can be effectively applied without giving any actual pain, and many uses will suggest themselves to the operator as he becomes acquainted with its merits.—W. D. T.

Protecting Gum Margins.—To protect the gum margins around a root prepared for a cast base, Davis Crown, between sittings, I use a small piece of gutta percha, sufficiently warmed to make it plastic. Thoroughly dry the root and apply the gutta percha partially, molding it to place. To insure the permanency of this covering until the next sitting I use a small-sized tack. Warm it in the flame, and imbed it through the gutta percha into the root canal. Your temporary protection will stay until you remove it yourself.—A. E. DE REIMER, *The Dental Review*.

Separating Plaster Models Without Separating Fluids.—Immediately upon removal from the mouth the impression is immersed in cold water for from five minutes to whenever it is wanted. The model is poured in the usual way, no separating fluid being used, and it will be found that the model does not adhere to the impression, but comes away clean.—J. MILLS, in *Oral Health*.

Oral Sepsis.—My clinical experience teaches me that if oral sepsis could be excluded, the other channels by which medical sepsis gains entrance to the body might almost be ignored.—SIR WILLIAM HUNTER.

Surgical Treatment of Dentoalveolar Abscess.—The surgical treatment of chronic dentoalveolar abscess is indicated in those cases where the medicinal treatment has failed to effect a cure, or where the root has been thoroughly filled and the abscess developed subsequently. Especially is surgery indicated in this latter class of cases, if the afflicted tooth is firm in the jaw and has a good natural crown or carries a well-adjusted artificial crown. It is always best to have a skia-graph taken to aid in determining the area involved, and whether or not the root has been properly filled. In those cases of failure to cure by treatment through the canal, and where surgery is to be undertaken, it is best, in my opinion, to fill the canals before operating, especially if the root end is

to be excised; for while it can be done, it is rather difficult to close the general large apical opening of the canal after excision.

This operation should be done under the most aseptic conditions; the hands of the operator and assistant, the site of the operation, as well as all instruments used, should be sterilized, and, in the absence of a skiagraph, a thorough exploration should be made that the amount of process and root involved may be noted.—J. P. BUCKLEY, *The Dental Review*.

Cavity Preparation.—If there is any one feature in the cavity preparation for a proximate gold inlay in bicuspid and molars of more importance than another, and one which assures the success or failure of the operation, it is the occlusal step. Too often, with the hope of saving tooth structure or because of the fear of causing the patient discomfort in excavating, the occlusal step results in a narrow, shallow groove with a slight T-groove bucco-lingually. This step should be made as broad and as deep as is consistent with the proportions of the tooth, and in no instance should a tiny tongue of gold be expected to retain a gold inlay for any length of time.—M. C. TRACY.

Abrasive Wheels for Polishing.—Excellent polishing wheels for gold or porcelain work may be made from the ordinary round typewriter erasers sold by the department stores at 48 cents a dozen. They contain enough abrasive material to work rapidly either wet or dry.

If the metal sides are pulled off there remains a wheel suitable for the polishing lathe. With a $\frac{5}{8}$ -inch sandpaper disk cutter, if you happen to have one in the junk drawer, or with a brass or steel tube of the same size sharpened to an edge at one end, four wheels suitable for the engine mandrel may be cut from each eraser. If the disk cutter is used, pull out the section of rubber tube from its interior recess, and if the section of tubing, punch the hole for the screw or pin of the mandrel with any convenient instrument. These wheels will bring joy to the inlay worker and prove great time-savers. By turning against a knife blade they may be shaped for special places, and their cutting and polishing qualities are surprising.

There are two makes of erasers—the E. Faber's and the American Pencil Co.'s, which differ in coarseness of grit.

Where gold inlays are to be finished in amalgam or other dies no other polishing device than these wheels is needed, after grinding to shape with suitable carborundum wheels.—H. W. G.

The Limit Drill for Exposing Pulp.—The bridge worker frequently desires to promptly expose pulps covered by a considerable layer of sound dentine. Often this may be done by careful work with drills or burrs without much discomfort for the patient while penetrating the dentine, but the possibility of plunging into the pulp unexpectedly often keeps the operator in a state of nervous tension which serves to increase the patient's apprehension and turn an otherwise simple operation into a rather formidable one.

A helpful device for this work is the "limit drill," made for use with the small anchor screws favored by some operators for anchoring gold fillings. The small shoulder safeguards against plunging through the wall of the chamber, and the blade may be reduced from the $\frac{3}{32}$ of an inch supplied to any shorter length desired for an individual case. Alternate use of the limit drill and a larger drill or rose burr for reaming the small opening made by the limit drill will frequently enable the operator to penetrate a considerable thickness of dentine and prick through into the pulp chamber with scarcely a suggestion of complaint from the patient.—H. W. G.

BOOK REVIEWS

BY C. FRANKLIN MACDONALD, D.M.D.

A TEXT-BOOK OF DENTAL HISTOLOGY AND EMBRYOLOGY, INCLUDING LABORATORY DIRECTIONS, by Frederick B. Noyes, B.A., D.D.S., Professor of Histology, Northwestern University Dental School, Chicago. 12mo, 510 pages, with 350 illustrations, and 19 plates. Cloth, \$4.50, net. Lea & Febiger, Philadelphia and New York, 1912.

The average dentist does not consider that dental histology or embryology is of very great importance in the practice of dentistry; it being to him a merely theoretical subject of little practical use.

Dr. Noyes in the present book has given a most clear and, to say the least, a most interesting exposition of this subject, and has throughout, directed all his efforts toward demonstrating the practical advantages of a knowledge of the dental tissues in cavity preparations, in pyorrhea and in orthodontia. At times, in order to bring out certain points, he has entered quite extensively into the field of pathology, making this book really one of Histo-pathology.

Beginning with the enamel, which is considered briefly from a strictly histological viewpoint, it enters into an elaborate study of the enamel structure relative to the preparation of cavity walls and margins, and in the pathological field shows the effects of caries upon enamel.

Dentin and cementum are next considered; the former in cavity preparation, its value as a support for enamel and its reaction to caries; the latter is considered in its possible relation to the subject of pyorrhea.

The nerve and blood supply and incidental pathological changes, the dental pulp, are well presented.

After a brief review of bone, the periosteum and the periodontal membrane are taken up, the latter in considerable detail, showing the importance of its constituent elements, physiologically in orthodontia and pathologically in pyorrhea.

The chapter upon the mouth cavity is short and rather superficial, omitting much of the histological details of the mucous

membrane, tongue, tonsils, etc. Possibly the author has assumed these structures to have been dealt with in a preliminary course of general histology.

General embryology is hastily reviewed, but dental embryology is enlarged upon and followed by a study of the growth of the jaw bones and teeth during childhood up to adult life.

The book is completed by twenty-four very short chapters, containing directions for laboratory work; also a chapter by Dr. Black describing his machine for preparing sections of the bony tissues, and a final chapter upon histological technique.

The illustrations are profuse, generally very clear and well labeled; some, however, may tax the imagination and a few are left to the reader to analyse.

The general practitioner will find this book interesting and profitable, and in this connection two sentences are worthy of quotation: "The study of enamel structure as related to cavity preparation will do more to improve the quality of the operation and to increase the facility of its execution than any one factor," and "If the dental profession is to keep pace with the development in these fields and apply the results of investigation to the treatment of diseases of the mouth, the study of the fundamental sciences must be more thorough." For the teacher the work should prove of value, especially the outlines of laboratory work, and it should be an excellent book to place in the hands of a student.

PRINCIPLES AND METHODS OF ORTHODONTICS. An Introductory Study of the Art for Students and Practitioners of Dentistry. By B. E. Lischer, D.M.D., Professor of Orthodontics, Washington University Dental School; Member of the American Society of Orthodontists; Author of "Elements of Orthodontia," etc. 12mo, 258 pages, with 248 illustrations. Cloth, \$2.75, net. Lea & Febiger, Publishers, Philadelphia and New York, 1912.

The correction of mal-occlusions is becoming of greater importance every day, and Dr. Lischer in this book of 258 pages presents in a brief manner the salient points and principles of orthodontics.

After a short introduction defining orthodontics, giving the

aim and scope and strongly recommending the practise of general dentistry as a preliminary to the specialization upon this subject, the author begins the first section of the orthodontics proper under "Principles of Treatment."

Here a short discussion of the modern theories of etiology with the diagnosis and prognosis of mal-occlusion is presented, and some changes in the present nomenclature are suggested. These changes seem worth while. This portion contains many quotations from eminent authorities with the references to their works. Considering a "system" as detrimental to scientific advancement, the author now reviews hastily the so-called "systems," and selects from each the best points, striving to present the fundamental principles which underlie them and showing that these principles in the main are all similar. He emphasizes the value of early treatment, not trusting to nature for self-correction, and proposes the axiom "mal-occlusion and its accompanying deformities are progressive, not static."

The second section under "Methods of Treatment" gives briefly the manner of treating the various mal-occlusions as drawn from cases which the author has personally conducted. The selection of cases are good and, on the whole, demonstrate very well all the situations which would be presented in the general routine of orthodontia. The expansion wire, or, let us hint, the Angle system with modifications, is exclusively used. The cases selected for illustration are evidently recent ones, some even in the process of completion or retention. It might have been well to show cases of long standing without retention. for this must be what tells the story of really successful orthodontics.

For a delineation of the principles of causation and methods of treatment of mal-occlusion, this book will answer the purpose quite well, and as a brief introduction to the subject and to stimulate interest in orthodontics it should be successful.

THE AMERICAN TEXT-BOOK OF OPERATIVE DENTISTRY. Edited by Edward C. Kirk, D.D.S., Dean and Professor of Dental Pathology, Therapeutics and Materia Medica, University of Pennsylvania, Department of Dentistry. Octavo, 932 pages, with 1015 engravings. Cloth, \$6.00 net; leather, \$7.00 net. Lea & Lebiger, Philadelphia and New York, 1911.

A perusal of the list of contributors to this book is almost

sufficient to recommend it. With one exception they are identified with various dental schools as teachers, and this fact should qualify them to write in a manner essentially fitted to the student, yet sufficiently elaborate to interest and instruct the graduate; and they have been eminently successful.

Dr. Alton H. Thompson has made the subject of Human Odontography as interesting as it perhaps can be made.

Dr. Noyes has written a chapter on Dental Histology with Reference to Operative Dentistry and a brief summary of the facts of tooth structure and the supporting tissues. The "reference to operative dentistry" is always kept in view, making this chapter not only theoretical as to histological facts, but practical as to the application of them.

Dr. James Truman, to whom the book is dedicated, considers the subject of antisepsis in dentistry with the possibilities of transmission of infections and the means of sterilization, emphasizing the fact that, while dipping instruments into an antiseptic fluid is beneficial, it is not sterilization.

Examination of the oral cavity, methods of separating for filling and means for modifying dentinal sensitivity is discussed in three chapters by Dr. S. H. Guilford. He does not mention the use of nitrous oxid and oxygen for the relief of sensitive dentin, a method just now giving most excellent results with a minimum of danger; nor does he suggest the substitution of novocain for cocain in the injection method, which is hinted at most briefly.

Technique of Cavity Preparation is by Dr. Thomas E. Weeks. While adopting the cavity nomenclature as suggested by Dr. Black, he does not discuss cavity preparations according to the so-called Black system—extension for prevention and regions of immunity are not touched upon. This matter would seem worthy of more mention, even though it be to modify Dr. Black's teaching, and not leaving it for the student to work out alone.

The application of the rubber dam and other methods for maintaining a dry field of operation is given in a short chapter by Dr. Louis Jack.

Filling cavities with the metallic foils and finishing the same, is discussed by Dr. Edwin T. Darby. The chapter covers the ground adequately, although the subject of the contact point

might be elaborated upon, especially as to shape and importance.

Dr. William Crenshaw takes up the use of the matrix in filling operations and shows where it is still of value in foil fillings. Dr. Crenshaw writes of the lack of *nerve fibers* in enamel as compared to dentin and cementum as one reason for the more rapid occurrence of decay in the two latter. This statement demands an explanation, which he does not give, when it is considered that *nerve fibers* have never been demonstrated in dentin or cementum. The protoplasmic filaments in the dentinal tubules are not, as far as is known, nerve tissue.

The subject of plastics and their uses is most interestingly presented by Dr. Marcus L. Ward. He has gone into considerable detail as to the nature of amalgam from a physical and chemical standpoint and the uses of the material. Cements, their compositions and uses are given likewise in detail. Gutta percha is rather condemned except as a root canal filling or temporary stopping.

Dr. W. A. Capon handles the subject of inlays. Porcelain inlays receives all possible consideration mechanically; for the rest, experience is suggested as the best text-book. Relative to gold inlays much has been quoted from Dr. Taggart, a most reliable source.

Under Treatment and Filling of Root Canals, Dr. Otto E. Inglis takes up a most important field of operative dentistry. He comprehensively gives the methods of removing live pulps and the handling of dead pulps under the various conditions which they may present. The use of Fomocresol dressing following the extirpation of a live nerve may not meet with approval by some, owing to the known irritating action of formaldehyde upon living healthy tissue.

Pyorrhea Alveolaris and the treatment of discolored teeth are two chapters by the editor, Dr. Edward C. Kirk. Well fitted to write upon both these subjects, Dr. Kirk has given a most interesting and unprejudiced presentation of pyorrhea alveolaris, a subject still somewhat in the realms of theory and speculation. He presents two classes of this disease, one the result of local disturbance and the other involving a systemic condition. He believes in both local and systemic treatment, as the case may require, and further, considers that under the proper treatment

this disease is curable. The chapter closes with an article upon Vaccine Therapy, one of the modern methods comparatively untried. Discolored teeth and the methods of treatment is approached from the chemical standpoint since, as Dr. Kirk truly states, "the problem is essentially a chemical one always."

Dr. M. H. Cryer gives a detailed description of the instruments for and the methods of extracting teeth, and indicates that extractions are practically all different and much depends upon experience. The use of general anesthetics is briefly considered.

Dr. Herman Prinz discusses the various methods of producing local anesthesia, and gives in detail the technique of local injection. This chapter would be greatly increased in practical value by the addition of illustrations.

The plantation of teeth, a practice little indulged in by the average practitioner, is written by Dr. Louis Ottofy.

Management of the deciduous teeth, by Dr. Clark L. Goddard, is clearly given. He believes in devitalization by use of arsenic, emphasizing, however, care in its application.

Orthodontia, a subject doubtfully in the field of strictly operative dentistry, is treated by Dr. Edward H. Angle. To those familiar with Angle's original book, "Malocclusion of the Teeth," this chapter will be familiar, but it is a most excellent summary and gives an adequate idea of the principles of this subject.

Under Dento-Facial Orthopedia, Dr. Calvin S. Case strongly advocates the necessity, under certain conditions, of extracting permanent teeth for the correction of facial deformities. He has many opponents, but this chapter will bear careful reading and thought.

Dr. Guilford's short article, "Oral Prophylaxis," completes the 913 pages, and is a plea for the dentist to educate his patients to co-operate with him in the care of the mouth.

The illustrations are generally profuse and good.

This American Text-Book of Operative Dentistry is most complete and worthy of a place in the library of every dentist, and is a most excellent book to recommend to students.

A MANUAL OF DENTAL PROSTHETICS. By George H. Wilson, D.D.S., formerly Professor and Demonstrator of Prosthetics

and Metallurgy in the Dental Department of Western Reserve University, Cleveland, Ohio. 12mo., 507 pages, with 396 illustrations. Cloth, \$4.00, net. Lea & Febiger, publishers, Philadelphia and New York, 1911.

Dr. Wilson in his preface states that this book is intended to be "a concise, modern text-book on Dental Prosthetics," and he has very ably succeeded in carrying out this design.

Beginning with a short consideration of the anatomy of the mouth, he carries the reader through the various methods of restoring by artificial substitutes certain losses which the oral cavity is prone to experience under various conditions, and in so doing he has confined himself to a discussion of replacement by plates as separate from the field of crowns and bridges.

The taking of impressions, a matter of great importance, is discussed in detail; and plaster, as usual, is considered the most important medium.

Anatomical articulation is given considerable space, devoted chiefly to a selection from the article by Dr. Gysi, the latest, most thorough and most scientific presentation of this subject the dental profession has yet received. The selection fortunately deals primarily with the practical findings of the doctor, omitting much of the theoretical discussion so confusing to the average dentist. The new Gysi antagonizer, while untried by Dr. Wilson, will, he feels, prove to be most excellent.

Dr. Wilson takes exception to some of the present prosthetic nomenclature, regarding it as unscientific, and in this he seems to be correct, as, for example, in the distinction between casts and models and the use of the term "articulator." A few other changes which he makes, in this respect, seem rather a personal selection on his part.

The value of clasps, properly adjusted, is emphasized, as opposed to those who wholly condemn them. At the only place where bridge work is mentioned he states: "There is a large class of cases where the best interests of the patient will be subserved with a plate denture"—a sentence worthy of thought and application.

Vulcanite, aluminum and gold plates are considered in their various aspects most interestingly, and in connection with continuous gum dentures, porcelain is briefly taken up. Some of

the methods advocated and presented, especially in vulcanite work, while undoubtedly giving the best and most artistic results, seem unnecessarily complicated and long, there being shorter methods in vogue which give most excellent results. Relative to the swaged gold plate and the cast gold plate, the former is considered superior.

The chapter upon interdental splints confines itself entirely to the mechanical side of the question, merely suggesting the correction of fractured jaws by the wiring method.

The discussion on the subject of cleft palate seems almost too strictly confined to the mechanical aspects, though the physiology of articulation and the anatomical conditions involved in these cases might be of interest and assistance. Of the Suerson or bulb obturators, practically nothing is given as to their construction.

In many instances the author has presented a terse and concise preliminary synopsis of the important steps in the order of their occurrence, followed by a more elaborate description of these steps; an excellent idea, especially for students.

For a brief and comprehensive text-book upon dental prosthetics this volume of Dr. Wilson's should be an excellent addition to dental literature, and should be of particular value for the student in conjunction with lectures upon this subject.

MOUTH HYGIENE. By John Sayre Marshall, M.D., Sc.D., Syracuse University; Captain U. S. Army, retired; formerly Examining and Supervising Dental Surgeon, U. S. A., President Board of Examiners. Price, \$1.50. J. B. Lippincott Company, Philadelphia.

The subject of oral hygiene at the present time is receiving considerable public attention, and is being recognized as a valuable adjunct to the propagation of good health.

Dr. Marshall's book is calculated to carry home most thoroughly the great importance of this subject which has heretofore been relegated to the background, being considered of little account and only fostered and kept alive by the misplaced, over-enthusiasm of the dentist. "Mouth Hygiene" is written for all those who in any way undertake to assist the movements for physical betterment among the classes.

Separating the subject into three parts—the author in Part I, after pointing out by statistics the great prevalence of oral diseases in civilized communities, enters into a consideration of the care the human mouth should receive from earliest infancy to and throughout adult life; also the importance of proper attention during illness. Proper mastication and breathing is advocated as of great value. The last chapter proposes the introduction of a proper course of instruction in mouth hygiene in the school curriculum; a unique suggestion is that of a “tooth-brush drill”—a chance for caricature by opponents, but a worthy suggestion nevertheless.

The second part considers the role that mouth sepsis may play as the direct cause of many diseases involving the eye, throat, stomach, intestines, and other viscera presenting facts worthy of most serious thought. Under “The Psychological Effects of Dental and Oral Diseases and Sepsis,” writing of children who at the approach and during the period of pubescence become vicious, untruthful, steal, etc., Dr. Marshall says: “These conditions are all the result of a disordered mind dependent upon the malnutrition and septic poisoning from which the child is suffering and call for medical, surgical, and dental aid.” This sentence, as it stands unqualified, will find many opponents. The quotation of a statement by Dr. Henry J. Jaulusz—“that he could tell instantly by looking at the teeth of a child what the criminal tendencies are”—preposterous on the face of it, is unfortunate in a book of this kind. This is closely followed by another bit that—“it is more important to look after a child’s teeth than to send him to Sunday school.” The teachings and influences of church and home in the development of the morals of the future generation should not be lost sight of in the present enthusiasm over the idea that physical cure will correct social evils. This field has been so recently entered, that statements like the above will hardly be approved, and they may bring discredit upon a good cause. The influence of physical ailments and deformities upon the morals of many individuals is, however, a most serious problem; and septic, unhealthy mouths, as Dr. Marshall shows, are a factor worthy of greater consideration than they have previously received.

The third portion of the book presents the Oral Hygiene

Propaganda, being made up of quotations from the reports of the great work done at the Marion School, Cleveland, Ohio; a scientifically conducted investigation upon the effects of oral hygiene, which gave most encouraging and amazing results.

Throughout the book Dr. Marshall has in general explained the scientific terms which it was necessary to use, the language, on the whole, being simple and comprehensive.

To all those laymen, nurses, philanthropists, etc., who are in any way concerned with methods for improvement of health, especially among the children, this book should prove very interesting and most valuable, and to the medical man or dentist who wishes an excellent exposition of what mouth hygiene embraces and its importance, this book should furnish all that is necessary.

CURRENT NEWS

Items of professional news, of general interest, will be received by the Associate Editor at 51 West Forty-seventh Street, New York City.

The annual convention of the Delta Sigma Delta Fraternity is being held this year in Washington, D. C., on September 9th and 10th.

Following is a letter of general interest from Fred B. Rhodes, Esq., attorney for the defense in the Taggart-Boynton suit, to Dr. M. F. Finley, Washington, D. C.:

May 21, 1912.

DR. M. F. FINLEY, *Washington, D. C.*

DEAR DOCTOR FINLEY:

I am in receipt of your request for a statement as to the status of the Taggart-Boynton case, and also asking for an expression as to my views as to the ultimate outcome of this case.

I am very glad to give you a statement as to the status of this case, but I am afraid any statement as to my views as to what the decision of the Court of Appeals will be, will not carry with it very much weight, in view of the fact that lawyers are inclined to be optimistic in the matter of their own cases.

Whatever my own views may be on this subject, it is absolutely apparent that Dr. Taggart's attorneys have not the slightest expectation of winning this case for their client. It has only been with the greatest difficulty that we have from time to time been able to get them to take any steps whatever. We had to secure an order from the Court compelling them to take their testimony within a limited time, and after the testimony of both sides was closed they made no effort whatever to have the case placed on the calendar for trial. The defense in this case took the most unusual action of having this case placed on the calendar for trial; otherwise the case would never have come to issue. This attitude on the part of the plaintiff upon whom the burden of prosecuting the case rests, indicates clearly that the plaintiff desires to postpone a final decision just as far as possible.

The decision of Mr. Justice Clabaugh has no bearing whatever on the status of the case except in so far as it compels us to bear the burden of prosecuting the appeal. Justice Clabaugh

frankly stated in deciding this case, that in view of the fact that it had come to his knowledge that both sides intended to appeal the case, he did not feel it necessary or incumbent upon him to read the great mass of testimony taken, leaving it to the Court of Appeals to examine into the testimony, as it would have been called upon to do, whatever the decision of the lower court may have been. This frank statement on the part of Justice Clabaugh will really result in our favor, as it will insure a careful examination of all the testimony in detail by the Court of Appeals, and it will not have the benefit of any criticism or analysis thereof by the lower court.

The trial judge in the lower court did not even attempt to designate which of the claims of the patent were sustained, but simply in a brief statement held the patent to be valid, which of course means that every one of the claims are sustained. No person, no matter how prejudiced he may be, could for one instant seriously contend that all the claims embraced in this patent are valid. If such should be held to be the case the result would be disastrous to the dental profession, as some of the claims are so broad as to cover almost the entire field.

The evidence in this case shows clearly that at least three dentists of prominence and irreproachable character practised the process for which Dr. Taggart was granted a patent several years prior to the granting of such patent. If the Court of Appeals believes the testimony of these witnesses, and there has been no attempt to impeach their testimony on this point, the court must decide in favor of the defendant.

My associates and myself have carefully considered this matter from every aspect and we have no hesitancy in stating to you that in our opinion a decision from the Court of Appeals in favor of Dr. Boynton is inevitable.

Very truly yours,

FRED B. RHODES.

OBITUARY

IN MEMORIAM

DR. SAFFORD GOODWIN PERRY.

Born at Wilton, N. Y., in 1844, died in New York City, December 22, 1911.

As a charter member of the New York Odontological Society, and as its president for three years, the name of Dr. Perry is closely woven into the history of this society.

Always a believer in the usefulness of the dental society as an institution, he had given unselfishly of his time and energy to promote the interests of this organization from its inception to the time that its activities were discontinued in 1911.

The prominent position occupied by the Odontological Society and the international reputation it enjoyed as an organization that stood for all that was best in the science and art of dentistry, was due largely to the loyal and untiring efforts of the member we now mourn.

Several of his splendid essays were prepared for this society, presented at its meetings, and now form a part of its archives. When the subject of discontinuing active work in the Odontological Society was under discussion, Dr. Perry expressed much regret that a society which had been so useful, and through which so much good had been done for the profession, should be disbanded.

He urged that the members be not hasty in reaching a decision, and expressed the hope that the organization would maintain its integrity even though its active work were over.

Dr. Perry's gentle and kindly manner and his keen sense of justice made him a respected executive, as well as a popular member in the ranks. His sympathy with the young man in dentistry and his uniform courtesy and generosity in all his relations with them, had endeared him to hundreds who will always remember him with gratitude.

As a lecturer on the faculty of the Dental Department at the University of Pennsylvania he was always warmly welcomed by the students. His keen sense of humor and a ready wit made his lectures interesting and entertaining, as well as instructive, and his youthful spirit drew his hearers to him and made them feel that he was one of them.

Dr. Perry's essays on dental topics stand out pre-eminently as examples of scientific and literary attainments, and his other writings, including prose and verse, give evidence of unusual gift and much cultivation.

In recording the death of our beloved fellow member, it is resolved by this society that dentistry as a profession loses one of its most useful and respected men.

That the dental profession in New York loses its best beloved member: and that the New York Odontological Society now mourns one of its most loyal and devoted followers.

It is further resolved that this minute shall be spread upon the record book of the society, and that a copy shall be sent to the family of the late Dr. Perry.

WILLIAM JARVIE,
HENRY W. GILLET,
WILLIAM D. TRACY,

Committee.

IN MEMORIAM

DR. WILLIAM E. HOAG.

Born at Centre Sandwich, N. H., in 1841, died in New York City.

April 14, 1912, in his seventy-first year.

Dr. Hoag came to New York in 1860, and took up the study of dentistry with his uncle, Dr. Charles Miller. He married Miss Kempton, and to this union one son was born, Joseph Kempton Hoag.

Dr. Hoag graduated in dentistry in 1872 from the New York College of Dentistry. Later he became interested in medicine, and took the course at the College of Physicians and Surgeons, where he received his medical degree in 1875.

Dr. Hoag's second wife was Miss Knowlton, and by this

second marriage he had two daughters and a son, all of whom survive him.

He was a member of the New York Odontological Society, the First District Dental Society, State of New York, and the New York Institute of Stomatology. He enjoyed his affiliations with all these societies, and was regular in his attendance at the meetings.

A close friend of Dr. Hoag's, a fellow practitioner of dentistry, says of him as follows: "Dr. W. E. Hoag was a man of strict integrity; honest and truthful, unselfish, genial, and a true friend. He was a gentleman in every way, honest in his dealings and to be depended upon under all circumstances.

"He was a successful practitioner and a very pleasant relationship evidently existed between him and his patients. He lived the allotted age of man, and had he conserved his health and strength would have lived longer. In his life, as in his speech, he was pure and chaste."

Whereas, through the death of Dr. William E. Hoag this society loses one of its valued members, be it resolved:

That a copy of this minute be spread upon the records of the Odontological Society, and a copy also be sent to the family of the deceased.

WILLIAM JARVIE,
HENRY W. GILLET,
WILLIAM D. TRACY,

Committee.

NOTICE

MASSACHUSETTS BOARD OF REGISTRATION.

A meeting of the Massachusetts Board of Registration in Dentistry, for the examination of candidates, will be held in Boston, October 23-24-25, 1912. For application blanks and further information apply to Dr. G. E. MITCHELL, 14 Water Street, Haverhill, Mass.

THE FORSYTH DENTAL INFIRMARY, BOSTON, MASS.

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THE FORSYTH DENTAL INFIRMARY

“Dedicated to the Children” is the inscription which will adorn a magnificent marble building now in the course of construction in the city of Boston.

Magnificent as it will be from an artistic and architectural point of view, its glorious white walls and tinted roofing rising from a cement foundation, the best which modern engineering can produce; all this is lost in insignificance when the grand object for which this building is being constructed is considered. This will be the care and preservation of the teeth of poor children, the remedying of those ills which result from improper breathing and nasal deformities, and the correction of those masticatory apparatuses so malformed that nutrition is seriously interfered with. All these benefits are to be given to the needy unfortunates at a cost easily within the reach of the poorest.

The people of Boston will be indebted to John Hamilton and Thomas Alexander Forsyth for this noble institution, it being founded by them in memory of their brothers, James Bennett and George Henry Forsyth.

The Messrs. Forsyth have appreciated the immediate need

of serious work in the direction of caring for those defects which originate about the mouth, and that they are correct in their assumptions, the report of the Division of Child Hygiene of the Boston Board of Health for the past year amply supports; for of all the defects recorded, 84 per cent. of them came under the headings—Defective Nasal Breathing, Hypertrophied Tonsils, Defective Teeth, Defective Palate, and Cervical Gland. With exception of extreme cases these statistics do not include defects of malocclusion.

To meet these conditions this Foundation was established and incorporated in 1910, and is to be directed by a Board of Trustees, consisting of Thomas Alexander Forsyth, President; Edward Hamlin, Vice-President; Harold Williams, John F. Dowsley, Nelson Curtis, Ervin A. Johnson, Gordon R. Mackay, Harold De W. Cross, Chester B. Humphrey, and Timothy Leary. After the building and equipment is completed at an approximate cost of \$500,000, there is to be an endowment fund of about \$2,000,000 for the maintenance of the institution. This institution, to be known as the Forsyth Dental Infirmary for Children, will be an independent institution free from all affiliations with any college, will be conducted by men selected from the profession in Boston, and all work carried on within its walls will be done by graduated men, dental and medical.

The site of the building is adjacent to the Fenway Park, in the vicinity of the Art Museum and Boston Opera House, and when built it will have considerable open land about it, to be converted into parks, graded and decorated to correspond to the surroundings, and thus to insure adequate daylight. The material of the structure is of Vermont white marble, and the roof is composed of cement, covered with light green tiling.

The building consists, in general, of three stories. The basement floor will be devoted to waiting rooms, opening directly from the adjacent parks or gardens, sterilizing rooms and

rooms for permanent and visiting staffs. The first floor will contain a lecture room, seating 250; a founders' room, research laboratories and museum, and the surgical rooms with wards for male and female. The top or infirmary floor will be the one of chief interest, and will contain the operating chairs in the large room, small laboratories for orthodontia, and waiting and consulting rooms. The operating room will contain 64 special chairs—7 feet 3 inches apart—on the outside row and accommodations for 44 more in a second row. In front of each chair will be a window, 9 by 15 feet; also skylights, so that there should be ample lighting. The flooring will probably be covered with battleship linoleum, which admits of easy cleaning, yet is easier for the feet than stone or cement. Each operator, besides being supplied with an operating gown, will receive an outfit of sterile instruments for each patient, and every precaution and care will be given to asepsis and cleanliness.

The general plan in outline seems to be to have a permanent staff of fifteen to twenty-five men recruited from the recent graduates, these men to be selected possibly by competitive examination, and they are to receive a compensation for their services, being very similar to the medical internes in the various hospitals. There will be a visiting staff of the older men, who will come at stated times. Nose and throat work is to be carried on by specialists in those lines; also general dental surgical work as may be necessary. The infirmary will be open to students of the various colleges who may care to watch the operations, but it is not expected that any students will carry on work. As the plans are completed, educational work for the public in Oral Hygiene and care of the teeth will be taken up and use made, in this connection, of the large amphitheatre for public lectures and demonstrations.

If space permitted, many details might be presented which would show the great care and thought which the Board of

Trustees, in conjunction with the builders, are giving to this work in order that the operators and public may receive the best of modern facilities conducive to comfort and ease of work.

This, roughly, is a brief review of a foundation, the first of its kind in the world. It is a noble and worthy object, deserving of respect and attention, and all should watch its progress and achievements that in the near future it may be emulated in those places where such charity is so necessary.

C. FRANKLIN MACDONALD.

SOME RECENT DEVELOPMENTS IN THE STUDY OF DENTAL CARIES¹

BY WILLIAM J. GIES.

Mr. Chairman, Ladies and Gentlemen:—It is always a pleasure to appear before your learned body to report the results of our work during the period that has intervened since our last previous communication. By way of introduction to the paper by Dr. Lothrop this evening, I wish to bring to your attention, briefly, some recent observations relating to the cause and prevention of dental caries. Many workers in all parts of the world have been giving serious and earnest attention to the subject of dental caries. It would be impossible, in a short address, to do justice to the achievements and conclusions of the many who have lately reported results. I shall restrict my remarks, on this account, to a discussion of one of the most important and far-reaching of the recent studies of dental caries. I refer to the book of Dr. H. P. Pickerill, on "The prevention of dental caries and oral sepsis," issued in London a few months ago (1912), and constituting the "Cartwright Prize Essay of the Royal College of Surgeons of England for 1906-10, with some additions."

The preface of Pickerill's book, written at the University of Otago, New Zealand, in November, 1911, contains the following statement: "When this work was commenced nearly six years ago, a 'plan of campaign' was drawn up to which it was decided to adhere and to continue the work until the whole field had been covered, or at least investigated to some extent. It was further decided to publish nothing until the chain of evidence was more or less complete." This statement explains why the many results in Pickerill's book were not made public, from time to time, as the data were obtained. Pickerill evidently sought to make the work very complete before he published any of the results in any section of his plan. I have brought the book with me and take

¹ Eighth contribution to the study of dental caries by the author and his collaborators under the auspices of the New York Institute of Stomatology. The previous papers were published in this journal: 1910, v, p. 262; 1911, vi, pp. 65, 289, 297, 323 and 334; 1912, vii, p. 199. The ninth paper in the series follows this one (p. 410). See discussion, p. 474.

pleasure in presenting it for your inspection this evening, as I proceed to discuss some of its features.

You will observe, as you examine Pickerill's book, that he treats thoroughly, comprehensively and concisely, both the causes of dental caries and means for its prevention. The following statements are broadly significant (pp. 23-24) :

"We therefore come to the conclusion (1) that *bacterial plaques* upon the teeth *are not an essential factor* in the causation of caries; (2) that the lodgement and infection of carbohydrate material is the essential factor, and that those circumstances which favor the formation of bacterial plaques upon the teeth also favor the lodgement of carbohydrates, and so the occurrence of the two usually coincides.

"Therefore it is evident that the two essential attacking forces in this disease are (1) the acid-forming organisms of the mouth, (2) the presence of fermentable carbohydrates—the first *active*, the second *passive*.

"The inception and progress of the disease are, however, by no means so simple as would appear from the above statements. The phenomena are profoundly modified by a large variety of factors, such as the character and number of *organisms* present, the *variety and amount of carbohydrate* material available for acid production, the amount, alkalinity, and diastatic action of the *saliva*, the resistance of the *enamel surface*, the shape and development of the jaws and the disposition of the teeth. And since these conditions vary in different individuals, it is evident that the possible permutations and combinations of the various factors are very numerous and complex. In fact, dental caries is similar to many other diseases. *It is not the 'effect' of any single 'cause,' but it is the resultant of several forces—it may be few or many, and not always similar—acting in one general direction, and which happen for a longer or shorter period to be coincident.*"

Pickerill's detailed and elaborate contributions to the knowledge of the structure, character and resistance of enamel seem to deserve your very special attention.

On a subject which has lately received extended notice in American dental literature—the possible prophylactic power of

salivary sulfocyanate against dental caries—Pickerill writes as follows (p. 176): "I have not made many observations in this direction; but such as they are they do not entirely accord with the findings of Michel, Low, and Beach; but the numbers are too small to make any deductions." Then, as if the tendency to draw conclusions could not be resisted, Pickerill proceeds to say, in the face of his own contradictory data (page 177): "On the whole, we may conclude that whilst undoubtedly sulfocyanate of potassium² is a beneficial element in saliva, and one making for freedom from disease, yet it cannot be regarded as the most important or only factor in producing a natural immunity to dental caries or oral sepsis."

Digressing for a moment, let me say that Michel, who claims to have been the first to suggest sulfocyanate prophylaxis against dental caries, who complains that his European colleagues have declined to take seriously his proposals on this subject, at the Munich congress in 1902 (and since), but who notes with pleasure the development of the sulfocyanate propaganda among American dentists, has recently suggested that the prophylactic value of sulfocyanate is due to its *oral* decomposition into prussic (hydrocyanic) acid with consequent "extraordinary" local bactericidal action³! Michel says nothing about any other effect of prussic acid in the mouth or body. This opinion of the leader in the sulfocyanate crusade is a stunning conception, in view of the prevailing American belief that sulfocyanate, in some way or other, restrains the carious activity of oral bacteria without injuring, though perhaps by "stimulating," the organisms! I fancy the *psychical* effects of salivary sulfocyanate are more important than its dental relationships—it certainly puts *words* in the mouths of many, whether it helps to keep teeth there or not.

Pickerill concludes his chapter on saliva with the following deductions (pp. 194-195):

"I. It is evident that the saliva is a fluid extremely variable in its composition and amount, but that these variations do not occur without reason, but rather in obedience to fixed and

² No one has shown that sulfocyanate of *potassium* actually occurs in saliva.

³ Michel: *Ergebnisse der gesamten Zahnheilkunde*, 1910, I, p. 436.

definite laws and in response to certain ascertainable stimuli.

"2. The mechanism controlling salivary secretion is extremely sensitive and complex, since different 'flavors' of little intensity are capable of being 'selected,' and give rise to secretions of saliva differing widely in character and amount.

"3. That practically all the normal constituents of saliva are, if present in sufficient amount, of value and importance in protecting the teeth against the occurrence of dental caries, and in maintaining the health of the oral mucous membrane.

"4. That *acids*, and particularly the 'natural' organic acids, are the stimulants which excite the greatest amount of these protective substances per minute, and, moreover, give rise immediately, and for a considerable time afterwards, to an increased *alkalinity* of the mouth. That, conversely, substances of little or no distinctive 'flavor,' and also alkalies, produce a diminution in the amount of protective substances per minute, and reduce the alkalinity of the mouth both at once and for some time afterwards."

The latter conclusion presents the key to the system of prophylaxis to which Pickerill devotes the concluding chapters of his book. I shall return to it later in this discussion.

Several months after your President, Dr. Howe, invited me, in 1909, to take a practical interest in the subject of dental caries, I had the pleasure of meeting the members of your Research Committee at an informal session. Although I frankly stated that I knew too little about the subject to speak learnedly regarding any phase of it, I presented several ideas regarding possibilities and plans. I suggested (1) that dental caries might be due to the action of microorganisms upon carbohydrates on and between the teeth, *localized* in both cases by "adhesive mucin masses," or by other mechanical fixations.⁴ I also expressed the belief (2) that the disintegration of "adhesive mucin masses," or their prevention, might be an important feature of prophylactic treatment against dental caries; (3) that both disintegration and prevention might be accomplished satisfactorily with dilute acid; and (4) that "food acids" (the

⁴The suggestion regarding microorganisms was a mere statement of the prevailing physiological opinion, but I imagined the idea about *local* fixation of microorganisms and carbohydrate by "adhesive mucin masses" was new. I soon learned that Dr. Kirk has previously emphasized the same conception.

typical fruit acids and their acid salts) might be effectively used for such purposes.⁵

My direct proposal to Dr. Howe, prior to the committee meeting to which I refer and the plan on which we had been proceeding, was a preliminary study intended to reveal, if possible, any existent relation between the composition of the saliva and the teeth of people in dental health and disease. The following statement was incorporated in the first report of our work on that general subject:⁶ "Mucin occurs in saliva, and apparently also on dental surfaces, primarily as acid-salts in concentrated colloidal solution. When viscid mucinous coatings are treated with basic material, such as carbonate of an alkali or an earthy element, the mucin mass becomes superficially more smeary and slippery by reason of the production of more soluble mucin salts *at the surface*. Complete mechanical removal of a mucin plaque from a tooth is facilitated by the addition of a *basic* material that renders the mucin superficially more viscous, but the slippery surface thus produced may make the application of considerable friction necessary for the detachment of the plaque. On the other hand, when a viscid, mucinous deposit is treated with *acidic* material, the mucin mass is completely disintegrated by a curdling or agglutinative process, the particles are devoid of adhesiveness to smooth surfaces, stickiness disappears because of the precipitation of caseous mucin itself, and the entire disorganized mass may be readily flushed away.

"The foregoing facts are responsible for our suggestion to Dr. Howe that *diluted* vinegar or common fruit juices—*acid media ordinarily present in food*—may be very helpful agents in the removal of mucinous masses from teeth, especially if applied directly with a suitable instrument. It is probable that the cleansing effect of such treatment would be less harmful to the teeth than the frictional operations now in use for similar purposes. That this suggestion is not as radical as it may appear to be is obvious from the fact that the effects of occasional *well directed* treatments of the teeth with *food acid* could not be more

⁵ These views were based on many years of experience in the work of precipitating mucins and mucoids, on the general physiological knowledge that salivary secretion is stimulated by fruit juices, and in the opinion that acid fruit juices could do no damage to enamel during their *transient* appearance in the mouth.

⁶ Lothrop and Gies: This Journal, 1910, v, p. 283.

deleterious than the influence of the same materials in the mouth, and on the teeth, when ingested with food."

About a year later Dr. Howe, in a notable address on "The degree of prevention of decay of teeth obtainable by oral hygiene" made the following allusion to the proposed "food acid" treatment:⁷ "The suggestion of Prof. Wm. J. Gies, of the Department of Biological Chemistry of Columbia University, that the teeth be washed and brushed with a solution of a vegetable acid, such as diluted vinegar, has had a few favorable reports in cases of great susceptibility to decay and marked inability of patients to keep their own teeth clean, but a sufficient number of trials extending over enough time, have not yet been reported by dentists to give assurance of its results. The reason given by Prof. Gies for the suggestion was that acids are capable of coagulating and breaking up mucin from its adhesions, and that the degree of acidity required would be so slight that no harm to the teeth's structure could result. This would be a radical departure from former ideas, based apparently on the supposition that dental disintegration is the result of the action of acid diffused through the mouth, and that this should be neutralized by alkaline lotions; whereas the worst cases of susceptibility to decay have been found when mouth fluids were markedly alkaline to litmus."

Last February Dr. Howe added this statement to the above:⁸ "I have several patients who have cleaned their teeth with a solution of vinegar for six months and more, and I have never seen their teeth kept so clean or found them so free from decay."

I am not aware of any systematic effort or purpose among dentists to test the simple suggestion I had the privilege of making more than three years ago, which was published two years ago, and which Dr. Howe mentions favorably in the foregoing quotations. As Dr. Howe says in the remarks that are quoted above, the proposed use of "a solution of a *vegetable acid*" (e.g., *diluted* vinegar, fruit juices with their acids and acid salts, vegetable extracts, etc.) "would be a radical departure from former

⁷ Howe: This journal, 1911, vi, p. 236.

⁸ Howe: This journal, 1912, vii, p. 277.

ideas." It appears that the suggestion has been disregarded because of a lack of confidence in it, due primarily, I presume, to traditional fear of "acid."

Pickerill states conclusions which not only support the proposed use of fruit and vegetable juices, etc., as dentifrices, but which also indicate a larger usefulness of such "natural acids" as essential elements in a *prophylactic diet*. Let me quote a few of his statements on this broad view of the utility of "food acids" and acid dietaries in the contest against dental caries:

"In order to prevent the retention of fermentable carbohydrates on and between the teeth, and so eliminate or very considerably reduce the carbohydrate factor in the production of caries, *starches and sugars should on no account ever be eaten alone, but should in all cases either be combined with a substance having a distinctly acid taste, or they should be followed by such substances as have been shown to have an 'alkaline potential;'* and the best of these are, undoubtedly, the natural organic acids found in fruits and vegetables" (Page 215).

"We are, therefore, driven to the inevitable conclusion that *alkaline dentifrices and mouth-washes for the prevention of dental caries must be abandoned*, and we further conclude that some substance which is a salivary stimulant should be used in order to promote and educate the activity of the salivary glands. Now, it has been also conclusively proved that the best substances for this purpose are *acids*, and there is not the slightest reason why the best should not be used in this case" (Page 226).

"The objection will probably be at once raised that acids are 'bad for the teeth,' in that they can be shown to decalcify them; this is one of the fallacies of experiments conducted entirely *in vitro*. It has been shown that comparatively weak acids are the best salivary stimulants, even though they should cause some superficial decalcification, which it will be shown they would not; but even if they did, and at the same time prevented caries from occurring, it would be *infinitely the lesser of the two evils*. The evil would be manifested probably as erosion, attrition, and abrasion; but these would be slow in progress, infinitely less in prevalence; and, moreover, the children would escape, which is the very gist of the problem with which we are

dealing. But would acids cause any decalcification when used in this way? We have already seen that five and fifteen minutes after their use the alkalinity index of the mouth is always considerably increased above normal, and that in the case of as strong an acid as citric in the lemon, two minutes after its use, and including small fragments of lemon, the saliva was intensely alkaline. This may be readily tested roughly by anyone with a piece of litmus-paper placed in the mouth or against the teeth half a minute after eating or washing the mouth out with anything weakly acid. Undoubtedly, there is a short time during which the acid remains unneutralized, but this is not sufficient to cause any effect, except, perhaps, on the occlusal surfaces in the case of masticating acid substances which are actively pressed and ground between these surfaces" (Pages 226-7).

"From a very large number of observations, I am convinced that no harm will accrue to the teeth from the use of those acids, in such strengths as they are active salivary stimulants. An acid substance which it is suggested should be used in a general manner for this purpose is *acid potassium tartrate*. This substance has several advantages:

"1. It is an active salivary stimulant.

"2. It is a form of acid which is widely distributed in nature, and one, therefore, to which the salivary glands have by the process of evolution been adapted.

"3. Its solubility is only 1 in 200 of water, and, therefore, if it be used in the liquid form there can be no danger of its being used in too strong a solution, either on account of faulty making-up or of subsequent evaporation.

"4. It has an agreeable taste, which may be made more so by the addition of saccharine. This is, again, an extremely important factor in applying these principles to children" (Page 227).

"Of course, *other acids or acid salts* may possibly be used in a similar manner. There are, however, *two dangers* to be guarded against—those of using an acid either *too weak* or too strong. If an acid be used in too weak a solution, it will certainly do much more harm than good, for it will reduce the alkalinity of the mouth without exciting any increased flow of saliva, and thus for some time the reaction of the mouth may be

actually acid; or the weak acid, by being unneutralized too long, may in a stagnating cavity attack the enamel of the teeth itself. This is evidently why the lactic acid of fermentation is not neutralized—it is formed in such small quantities that the gustatory nerves are not stimulated. If an acid be used in too strong solution, it may have a precisely similar effect: the stimulus to the gustatory nerves will be too great; it will have a paralyzing effect, and the flow of saliva be consequently diminished, giving the opportunity to the stronger acid to directly attack the teeth" (Page 232).

"Acid mouth-washes will also, I think, prove to be beneficial in reducing the number of acid-forming organisms in the mouth; for, as is well known, those organisms which form acid are very sensitive to the action of acids.⁹ Moreover, all organisms are very sensitive to sudden changes in the composition and specific gravity of the media in which they are growing, and such changes are brought about in the saliva by the action of weak organic acids" (Page 232).

"The use of such mouth-washes will also tend to keep the calcium phosphate and carbonate in solution, instead of their being precipitated upon the teeth in the form of calculus, which, as is well known, sooner or later leads to a serious condition of *oral sepsis*. On the other hand, the use of chalk dentifrices frequently promotes the formation of calculus by particles remaining against the teeth and acting as a focus for precipitation of lime salts from the saliva" (Pages 232-3).

"The diet of all 'natural' races and of those *relatively immune* to caries . . . is characterized by *variety* and *sapidity*. . . . Further, it will have been noticed that, although a variety of sapid substances are used, yet the ones most frequently recurring are *acid in reaction, chiefly fruits and berries*; and, as has been previously shown, these are the very stimulants which produce the most profuse and the most alkaline flow of saliva, and to this latter I think we are justified in ascribing the relative immunity found in the races which have been considered" (Pages 264-5).

"We may, therefore, conclude that the dietary of civilized

⁹ Oppenheimer: "Ferments and Their Action," p. 237; Cohn: *Zeitschrift f. physiol. Chemie*, 1890, xlv, p. 75.

communities at the present time errs seriously in the direction of being too soft, of having too high an acid potential, of being not sufficiently stimulating to the salivary glands and not sufficiently detergent " (Page 276).

" In considering how such a dietary may be corrected, social and economic conditions have to be borne in mind; it is neither possible nor desirable that any sudden or drastic change should be made. Conditions must be accepted as they are found, and an attempt made to improve them. It is impossible, for instance, under modern conditions to ban absolutely all soft and fermentable carbohydrates. Improvement in this direction may come in time, but it will be essentially a slow and gradual process, depending upon the rapidity with which people are educated to demand such an alteration. Sufficient has, however, been said to show how the majority of food substances of high acid potential may be rendered practically innocuous " (Page 276).

" It has been shown that by the combination of strong salivary stimulants with such substances, either in a mixture or, much better, in sequence, the acid production may be reduced to a minimum or entirely negatived. What is therefore to be advocated is that *all meals should contain a fair proportion of salivary excitants, and, more important still, should both commence and end with some article of diet having an acid reaction*. This does not of necessity imply a 'vegetarian' diet; in fact, many 'vegetarian' meals are distinctly conducive to caries on account of their soft, pappy, and adhesive nature " (Page 276).

" Taken in such a manner, the total amount of fruit and vegetable need not be large, and in no case should such a dietary be commenced suddenly; it should, especially in those who have been unaccustomed to the inclusion of fruit and salad in their dietary, be worked up to gradually, commencing with one meal a day; then, after a week or so, two meals may be terminated with 'acids,' and finally the principle may be extended to all meals. Should any intestinal irritation be set up, the inclusion of boiled milk in the dietary will correct it; this I have found to be but very occasionally necessary, and only in the initial stages. The much-dreaded bugbear 'diarrhea' is much more likely to be caused by eating fruit in an unclean condition than to be due to the mechanical or chemical action of the fruit on

the bowels. All fruit, therefore, especially that of unknown source, should be well washed or have the skin removed before being eaten. The only effect of fruit taken regularly and in such moderate quantities is to insure a full and regular action of the bowels " (Page 278).

Much that is said in the foregoing quotations is based on the well-known stimulating power of weakly acid media to excite salivary secretion. Much that Pickerill has stated reiterates what I have said here, speaking under your auspices, on former occasions formally and informally. Much that Pickerill proposes, as formulated in these quotations is new, but very suggestive and probably highly important. I earnestly suggest that dentists open their minds to possibilities of the proposed "food acid" prophylaxis (if prejudice or tradition has closed them), and that effective clinical tests of the value of the proposed measures be instituted in as many quarters and by as many dentists as possible.

At your meeting last February¹⁰ I made the following statement in this connection: "Let me digress for a minute, again to urge attention to my suggestion, as stated two years ago, that dilute solutions of various natural organic acids (*e. g.*, *diluted vinegar and diluted fruit juices*), may be useful agents for cleansing the teeth, *both by their disorganizing effect on mucin plaques and by their stimulating influence on salivary flow, with consequent natural flushing of the oral and dental surfaces*. The current general employment of alkaline or basic dentifrices does not appear to me to be wholly warranted. I know this suggestion is a radical one, but all I propose is that the matter be given a trial. *My suggestion can be tested in the conviction that harm will not result to any one before the value of the treatment is ascertained*. The suggestion can be definitely and emphatically rejected if the deductions on which it depends are unfounded."

Pickerill's proposed use of acid potassium tartrate will be recalled by some of those present at former meetings as included in my informal suggestions to a few of your members who have suggested privately that diluted vinegar or juices of grapes, lemons, orange, apples, and other fruits might be too "irritating" or "destructive." I have also suggested to some members

¹⁰ Gies: This journal, 1912, vii, p. 277.

of your society that *carbonated water*, or certain types of dry, *acid-protein products*, or a dilute *acid* solution of di-sodium hydrogen phosphate and di-hydrogen sodium phosphate, with the latter predominant, might be as useful as any of the fruit juices, or the acid or acid salts obtainable from them. Even boric acid should be tried. I believe that many such physiological possibilities should be tested, and I hope to be able to report, next year, the results of studies with a number of them. But the main tests of these possibilities must be made and reported by dentists themselves.

It is interesting to observe that Dr. Pickerill is apparently unaware of the reports of your proceedings during the last three years. I have been wondering why no mention is made by him of some of the proposals which have anticipated his. Certainly not from any cheap desire to ignore the facts of dental history. His book shows him to be too big a man for that. I don't believe he ever heard of our work. His own studies have been conducted in far off New Zealand. Our reports to you have been published in your "*Journal of the Allied Societies*." What in the name of dentistry are those allied societies? Are they a brewers' confederation or allied trades organizations? Are the "Allied Societies" a combination of social workers or amalgamated singing societies? What sort of an alliance does "the journal" represent? I fancy most of your foreign colleagues in dentistry are wholly unaware of your proceedings, and unless your journal has been brought directly to their attention, know nothing about it. "What's in a name!" In this case nothing—most emphatically and politely, nothing! Why not raise the banner of dentistry and put dental into the title of the "*Journal of the Allied Societies*?" You could then consider Pickerill, in the language of the "funny men" in our newspapers, as the man who put the dent in a fortunate dental incident.

In several of our discussions I have emphasized my belief that alkaline dentifrices lack the prophylactic power attributed to them as solvents of mucin and mucin plaques. I have also called attention to the fact that the alkalinity of dentifrices either favors or does not interfere with the growth of many bacteria and also inhibits the activity of the salivary glands, without neutralizing the fermentation acid that is cumulatively produced on,

and which combines with basic matter in, the enamel and dentin at the points where caries originates and proceeds. Fruit juice not only disintegrates the mucin collections, but also injures most oral bacteria, thus reducing tendencies to carbohydrate fixation (particulate and molecular) and diminishing fermentation, to say nothing of the flushing effect of the increased flow of saliva which Pickerill emphasizes and which accentuates the conditions I have mentioned.

The propaganda in favor of alkaline dentifrices is maintained by those who sell the goods—physiologists are not responsible for it. Dentists should no longer assist in maintaining the widespread delusion that “*antiseptic*” dentifrices destroy all oral micro-organisms present at each application, and, in this way, prevent dental caries.

I have quoted Pickerill at some length. I have emphasized his prophylactic views. They accord with much that I myself, in your service, have urged you, from time to time, to consider. Pickerill may be mistaken, I may be wrong, but the harmony in the opinions we have derived independently, and the great mass of evidence Pickerill has accumulated during the six years of work which he conducted, suggest, if you have any confidence in our conclusions, that you give earnest attention to the possibilities I have mentioned, and that as scientists and clinicians you determine their value.

At the conclusion of the address, Dr. Lothrop and the speaker demonstrated (1) the qualities of salivary glands from oxen and aqueous extracts of such glands, (2) the precipitation and nature of mucin from such extracts, (3) the properties of dry preparations of pure mucin, and pure sodium and potassium salts from human saliva and bovine salivary glands, (4) the ready precipitation, by fruit juices, of mucin from aqueous solutions of its salts, and (5) the precipitation of mucin from bacterial cultures (containing mucin salts) by the acid produced by the bacteria. Detailed statements of methods of preparation, etc., are given in the succeeding paper which, at Dr. Gies's suggestion, was read by Dr. Lothrop before general discussion was invited. The discussion is reported on page 474, and Dr. Lothrop's paper follows this one.

A STUDY OF SALIVARY MUCIN¹

BY ALFRED P. LOTHROP.

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INTRODUCTION.

Among the organic constituents of saliva probably the most interesting from a chemical as well as the dental point of view is salivary mucin. To this substance the saliva owes its mucilaginous character, its consistence being dependent upon the proportion of dissolved mucin. Mucins and mucoids occur in other fluids and tissues of the body, the term "mucin" being applied to glucoproteins which are elaborated by true secretory cells and "muroid" to similar substances in the tissues (1). Mucin is a conjugated protein, containing a carbohydrate radical which is split off on hydrolysis yielding a substance that reduces an alkaline copper solution. Eichwald (2) was the first to observe that a reducing substance could be separated from mucin and to regard mucins as composed of a protein plus a sugar radical. The glucoproteins do not readily dissociate into the protein and carbohydrate groups, the latter being set free only by very energetic chemical treatment whereby the protein portion of the molecule is also hydrolysed at least into proteoses.

Mucins are found in most of the slimy fluids of the body and are excreted normally partly by the goblet cells found on the surface of all mucous membranes such as the respiratory and alimentary tracts, the bile ducts, urinary passages, etc., and partly by the deep seated mucous glands and especially by the submaxillary gland. Mucins have been isolated from the sputum (3), bile (4), the mantle and foot of the snail (5), in the envelope of perch eggs (6), in frog spawn (7), and in certain pathological conditions (8). The closely related mucoids have been obtained from tendon (9), bone (10), cartilage (11), ligament (12), the

¹ Read before the First District Dental Society, October 7, 1912, at the New York Academy of Medicine. This is the ninth paper in the series of studies now in progress in this laboratory. See page 397.

vitreous humour (13), the cornea (14), the umbilical cord (15), from ascitic fluid (16), and from egg white (ovo-mucoid) (17).

Ishii (18) found in the yam, *Dioscorea japonica*, a substance undoubtedly mucin, containing sulfur and yielding a reducing substance and an albumose. The ground up yam yields an extraordinarily slimy mass which gives a heavy precipitate with acetic acid. Mucin has also been isolated from the yam, *Dioscorea batatas* (19). The formation of mucin by bacteria (20) has also been shown. Rettger (21) obtained a mucin-like substance from bouillon and peptone cultures of many organisms. It was presumably an intermediate substance, a pseudo-mucin, as very slimy cultures yielded only a slight precipitate with acetic acid. Its production did not depend upon the presence of a carbohydrate and its presence did not increase the amount of mucin.

The mucins and mucoids are acid compounds containing no phosphorus and yielding a reducing substance on being boiled with acids. Müller and Seemann (22) obtained as high as 42 per cent. of glucosamin (a nitrogen-containing derivative of glucose) from submaxillary mucin. It is probable that in mucin the glucosamin groups are acetylated as it gives the Ehrlich reaction with diethylaminobenzaldehyde which glucosamin itself does not (23). According to Steudel (24) the reducing substance is not simple glucosamin and has no free amino (NH_2) groups. By the action of pepsin-hydrochloric acid or trypsin as well as intracellular enzymes, mucin is digested without the solution yielding a reducing substance. On hydrolysis part of the sulfur appears as sulfuric acid indicating the presence of an ethereal sulfuric acid radical (23). The mucins have particularly low carbon and nitrogen contents and a high oxygen content, giving them a low heat value (25). They also contain relatively large amounts of sulfur. The percentage composition of various mucins and mucoids is given in Table 1. These proteins differ from most of the native proteins in not being coagulable by heat. In this respect they resemble the nucleoalbumins but differ from them in containing no phosphorus. They are easily denatured by alkalis and alcohol, no longer showing the usual mucilaginous characteristics. This change is permanent and irreversible. The mucins and mucoids are strongly acidic—they redden blue litmus; they are precipi-

TABLE I.

Percentage Composition of Various Mucins and Mucoids.

	C	H	N	S	O	
Tendon mucoid....	48.76	6.53	11.75	2.33	30.63	Chittenden and Gies (9)
Tendon mucoid....	48.04	6.67	12.47	2.20	30.62	Cutter and Gies (9)
Osseomucoid	47.07	6.69	11.98	2.41	31.85	Hawk and Gies (10)
Ligament mucoid..	13.44	1.61	...	Richards and Gies (12)
Chondromucoid ...	47.43	6.63	12.22	2.32	31.40	Hawk and Gies (10)
Chondromucoid ...	47.30	6.42	12.58	2.42	30.63	C. Th. Mörner (11)
Cornea mucoid.....	50.16	6.97	12.79	2.07	28.01	C. Th. Mörner (13)
Umbilical mucoid..	51.33	6.63	14.13	1.04	26.87	Jernström (15)
Ovarial mucoid....	51.76	7.76	10.70	1.09	28.69	Mitjukoff (8)
Serum mucoid.....	47.60	7.10	12.93	2.38	29.99	Zanetti (26)
Amyloid	49.44	6.79	13.92	2.79	27.06	Krawkow (27)
Submaxillary mucin	52.20	7.18	11.87	...	28.75	Obolensky (31)
Submaxillary mucin	49.93	7.27	13.98	0.70	30.12	Landwehr (32)
Submaxillary mucin	48.84	6.80	12.32	0.84	31.20	Hammarsten (33)
Sputum mucin....	48.26	6.91	10.70	1.40	32.73	Müller (3)
Synovial mucin....	51.05	6.53	13.01	1.34	28.07	v. Holst (28)
Snail mucin.....	50.32	6.84	13.65	1.75	27.44	Hammarsten (5)
Frog's spawn mucin	52.90	7.20	9.24	1.32	29.32	Giacosa (7)

tated by acetic acid and by mineral acids but are soluble in an excess of the latter. They are readily soluble in alkalis, alkaline carbonates and ammonia but are quickly decomposed by a slight excess (29). Otori (30) obtained the following cleavage products from pseudo-mucin: leucine, tyrosine, glycocoll, glutamic acid, oxalic acid, guanidine, arginine, lysine, humus substances and levulinic acid. The presence of levulinic acid among the dissociation products shows the presence of a true carbohydrate radical in pseudo-mucin.

The chemical nature and properties of the mucin obtained from the submaxillary glands of oxen have been carefully investigated owing to the relative ease in obtaining it. Obolensky (31), investigating mucin, found it in the submaxillary but not in the parotid gland. His product was easily soluble in lime and baryta water from which solutions it was not precipitated by tannic acid, ferric or mercuric chlorid. Heated with dilute sulfuric acid it yielded a strong reducing substance and a residue of acid albumin. From his impure product he obtained leucin and tyrosin on hydrolysis with 1:3 sulfuric acid.

Hammarsten (33) investigated the methods employed in pre-

paring mucin from submaxillary glands and found that the product obtained by precipitation with acetic acid was always contaminated with nuclealbumin, which gave a high nitrogen content. He devised a method for the separation of the mucin and nuclealbumin which is briefly as follows: the mucin and albumin are precipitated by adding to the water extract of the gland hydrochloric acid to the extent of 0.1-0.2 per cent., but immediately redissolve in that concentration of acid. If now the acidulated extract is poured into four volumes of water the mucin is precipitated and the nuclealbumin remains in solution. By repeated reprecipitations he was able in this manner to prepare pure submaxillary mucin. Hammarsten found that mucin is very easily modified by alkali and is split somewhat even by ammonium hydroxide. It undergoes a change by the action of alkali into a nitrogen richer substance resembling acid albumin and a nitrogen poorer, more peptone-like substance. It is possible to obtain a neutral reacting mucin solution with alkali and alkali-earths which is not altered by heating. A large excess of alcohol is necessary for precipitation without the addition of sodium chlorid.

Malenük (34) investigated the chemistry of mucin and considers it a combination of a globulin and a protein much resembling the "glycoalbumose" of Pick. The mucin globulin has a much simpler composition than other globulins, yielding very little hexone bases, no histidine, but much lysin. The protalbumin of mucin obtained by treatment with alkali or with pepsin-hydrochloric acid contains no loosely combined sulfur.

According to Levene (35) the mucin of the submaxillary gland contains an ethereal sulfuric acid radical, either chondroitin sulfuric acid or one closely related to it. Mucin is not a simple conjugate of protein and carbohydrate but a protein amino-carbohydrate compound containing an ethereal sulfuric acid.

To dental investigators salivary mucin has been of interest on account of its possible relation to dental caries. Lohmann (36) advanced the theory that caries results solely from the action of mucin upon the teeth, the mucin being liberated from its combination with sodium, potassium or calcium by the presence of some weak acid in the mouth. He claims to have shown that

mucin has as strong a decalcifying action upon enamel as lactic acid. Miller (37) attacked Lohmann's view as being at variance with some of the simplest facts of dental pathology and bacteriology, and by a series of exhaustive experiments completely disproved the theory. He acknowledges, however, that a large amount of mucin in the saliva is a hindrance to the proper cleansing of the teeth and that it facilitates the precipitation of fine food particles which may undergo fermentation leading to the production of acids and furthermore that it forms a good culture medium for bacteria.

In a previous paper from this laboratory (38) the opinion has been expressed that salivary mucin is involved in the inauguration of the carious process. To quote: it is "our conviction that salivary mucin favors the onset of dental caries by facilitating local attack by microorganisms. . . . this favoring action is primarily a physical one, dependent on the viscosity of mucin solutions and the consequent stickiness of mucin layers or deposits. Bacteria and fungi would be entangled and held in such sticky films on teeth, but would not be affected unfavorably in their growth and multiplication there by the contained mucin or mucin salts. In fact, both mucin and its salivary salts provide nutrient material for microorganisms."

Kirk (39) has investigated the possible mucinous origin of the "bacterial plaque" and has reported the precipitation of mucin in a single plaque in a mucin-glucose solution made alkaline with Na_2HPO_4 and colored blue with litmus solution, which was reddened by the acid formed by the microorganisms. He suggests that the precipitation of mucin by secreted lactic acid may be a prominent factor in the localization of the decay process in caries susceptibles. In the fermentation of glucose, lactic acid is produced causing an immediate precipitation of mucin about the bacterial growth which adheres to the tooth surface by virtue of the precipitated mucin acting as the binding material of the agglutinated mass.

Jones (40) has experimentally produced gelatinous plaques upon slabs of dentine in a maltose-mucin medium by the action of microorganisms. He considers the coagulated mucin mass as a close combination of the acids of fermentation and the "pro-

teids of the mucin." The primary coagulating effect of acid products upon the mucin of the saliva, thus creating physical protection as well as a dialysing membrane, has as much to do with the production and retention of deleterious products upon the teeth and in the mouth, with the exception of negative symbiotic relations of bacteria, as has any other factor. The secretion of the plaque is not an inherent characteristic of the mouth bacteria.

In his book, "The Prevention of Dental Caries," Pickerill (41) writes: "In the ordinary viscous condition in which it (mucin) is present, it is undoubtedly to be regarded as being favorable to the development of dental caries and oral sepsis in so far as it forms a sticky mixture with carbohydrates, binds them to the teeth and tissues, and thus facilitates the prolonged action of the incorporated organisms." It is his opinion that the source of some of the plaques found on teeth is undoubtedly the mucin precipitated by weak acids and acid salts.

Mann (42) gives the following description of the properties of submaxillary mucin; it forms a white, loose powder which may be preserved in a dry state for years without its properties becoming altered. It is practically insoluble in water and in neutral salt solutions; it is insoluble in acids but forms a tough adhesive curd on the addition of acetic acid. It is readily soluble in very dilute alkalis forming a neutral or slightly acid solution. A solution containing only 0.23 per cent. of mucin behaves like a typical mucilaginous solution, viscous, adhesive, and readily pulled out into shreds. It is precipitated from its solution by acetic acid but the precipitate, instead of being flocculent like the ordinary albumins, forms a tough mucilaginous mass which winds around a glass rod if stirred.

Mucin is only slightly soluble in an excess of acetic acid but dissolves readily in 0.1-0.2 per cent. HCl. It is precipitated by acids only if the solution is poor in salt, not being thrown out of solution in the presence of NaCl. It is not coagulated on boiling and can be separated from albumin by coagulating the latter at the boiling point by the addition of acetic acid in the presence of NaCl. Mucin is not precipitated by alcohol unless neutral salts are present. It is precipitated by HNO_3 , CuSO_4 ,

HgCl₂, FeCl₃, and lead acetate. The alkaloidal reagents do not give precipitates in neutral solutions but throw down mucin which has been rendered soluble by the addition of an excess of HCl. Potassium ferrocyanide does not precipitate. Mucin may be "salted out" from its solutions with sodium chlorid, magnesium sulfate and ammonium sulfate.

Mucin is very resistant to acids but is readily denatured by alkalis: if it is kept for some time in a feebly alkaline solution, it is at first still precipitable by acetic acid like a typical mucin, but it soon gives rise to a flocculent precipitate, and finally the whole of the mucin flocks out, the solution losing its typical slimy character and becoming a limpid fluid. The mucin is changed into a metaprotein, possessing different properties and a different composition which is readily precipitated by salts and may be precipitated by neutralization of its solution. Furthermore it differs from mucin in now being precipitated by potassium ferrocyanide-acetic acid. Ammonia is given off if mucin is treated with stronger alkali solutions. In addition to metaprotein, proteoses may be formed.

With pepsin and trypsin, mucin dissolves to a water clear solution, containing proteoses, without the splitting off of a carbohydrate radical. Towards putrefaction mucins are very resistant, owing to their acid nature. With alkalis and alkali earths, mucin forms soluble soaps, the natural occurring mucin probably being sodium mucinate. It is very difficult to prepare chemically pure mucins, as even strongly mucilaginous fluids contain only small proportions. Mucin solutions do not filter or settle out at all readily and there is always danger of denaturation by means of alcohol or alkalis.

EXPERIMENTAL.

1. Preparation of mucin from submaxillary glands of the ox.

Submaxillary mucin can be extracted from the salivary glands of oxen in fairly abundant quantities, the yield being from 0.8-1.0 per cent. of the weight of the glands used. The method used was that proposed by Hammarsten as modified by Levene (43) and is essentially as follows: The glandular tissue is freed as completely as possible from fat and connective tissue. It is then put through a fine hashing machine, yielding a very

slimy mass. The ground tissue is extracted with 8 volumes of distilled water to which is added chloroform to about 5 per cent. The extract is repeatedly shaken and the extraction allowed to continue over night. The supernatant slimy liquid is siphoned off and shaken thoroughly with an excess of ether. Most of the tissue debris is thus separated and rises to the top with the layer of ether after standing over night. The underlying liquid is siphoned out and filtered through either C.S. & S. No. 597 or No. 604 filters. Filtration is slow and it is well to allow it to go on over night. A slightly opalescent solution is obtained which on centrifuging yields no sediment after two minutes. Ten per cent. HCl solution is added to a concentration of 0.15 per cent. By this procedure the mucin and nuclealbumin are precipitated but immediately redissolve. The acidified solution is then poured into 4 volumes of distilled water. The nuclealbumin remains in solution in the weak acid while the mucin is precipitated in stringy masses which wind around the stirring rod when the solution is vigorously stirred. The mucin is redissolved in 0.15 per cent. HCl solution, reprecipitated by 4 volumes of water and the procedure repeated a third time. The adherent acid is then washed out by stirring thoroughly in a large volume of water. By this treatment the mucin separates into flakes which settle to the bottom. The water is siphoned off and 95 per cent. alcohol is added. This is repeated until the concentration of the alcohol reaches approximately 95 per cent. The alcohol is then filtered off and the mucin is shaken with ether, filtered, washed with ether and dried in a dessicator. The final product is a brownish white powder.

Preparation I. An extract of 300 gms. of glands was made with 1200 cc. water plus chloroform. After straining a second extract was made using 600 cc. water. Before shaking up with ether an equal volume of water was added. There was a thick ether layer of tissue and the underlying liquid was fairly clear but opalescent. Filtration was fairly rapid giving a somewhat cloudy filtrate which, however, on centrifuging for one hour showed no sediment. The mucin was precipitated three times as usual; the third time it was necessary to add a few drops of NaCl to cause complete precipitation. The product was washed and dried in the usual manner.

Quantitative analyses on the powder, dried to constant weight at 105-110° C., gave the following results: ash, 0.31 per cent.; sulfur, 0.59 per cent.; nitrogen, 12.33 per cent.; nitrogen, ash free, 12.37 per cent.

Preparation II. In this preparation the mucin was thrown out the second time with tap instead of distilled water. Otherwise there was no variation from the standard method. Analyses gave these results: ash, 0.53 per cent.; sulfur, 0.61 per cent.; nitrogen, 12.36 per cent.; nitrogen, ash free, 12.43 per cent.

The ash had a decided yellow color indicating the presence of iron. This is explained by the fact that tap water was used. The mucin carrying down with it by adsorption the iron in the water.

Preparation III. Extractions were made of 1545 gms. of glands. The 0.15 per cent. HCl solution of the mucin was strained each time through white china silk.

Yield, 14 gms.; ash, 0.28 per cent.; sulfur, 0.65 per cent.; nitrogen, 12.49 per cent.; nitrogen, ash free, 12.53 per cent.

The acidity of this preparation was determined in the following manner: About 20 mgs. of the dry powder was rubbed up in an agate mortar with 10 cc. of 0.1 per cent. NaOH solution. The solution was flushed into a beaker and allowed to stand for different periods of time. The excess of alkali was then titrated with HCl solution, using phenolphthalein as the indicator. The results obtained were the following:

1 gm. mucin = × mgs. NaOH.

After 10 mins.....	66.3	After 60 mins.....	106.7
" 20 "	66.6	" 60 "	112.3
" 20 "	58.9	" 180 "	169.0
" 30 "	61.1	Over night.....	316.8
" 30 "	59.6	" "	356.5
" 60 "	114.4	" "	432.0

Analogous experiments using 1 cc. of a 2 per cent. solution of egg albumin indicated that the formation of metaprotein does not appreciably occur until after 30 minutes so that the results obtained in a shorter period of time are an index of the acidity of the compound. Müller (44) found that 1 gm. of sputum

mucin required 50 mgs. of NaOH for neutralization, a figure approximating those here recorded.

Preparation IV. Seventeen hundred grams were used for this preparation. The mucin content of the glands was not as great as observed in other cases. There was no variation from the standard method of extraction and purification.

Yield, 12 grms; ash, 0.37 per cent.; sulfur, 0.55 per cent.; nitrogen, 12.49 per cent.; nitrogen, ash free, 12.56 per cent.

A summary of the analytical results is given in Table II.

TABLE II.

Percentage Composition of Submaxillary Mucins.

	N.	S.	Ash.
Obolensky (31).....	11.87
Landwehr (32).....	13.98	0.70	...
Hammarsten (33).....	12.32	0.84	0.35
Preparation 1.....	12.37	0.597	0.31
" 2.....	12.43	0.614	0.53
" 3.....	12.53	0.65	0.28
" 4.....	12.56	0.547	0.37

2. *Preparation of Mucin from Saliva.*

It was our desire to obtain if possible an abundant supply of human saliva from which to prepare mucin. The co-operation of a large number of dentists was solicited to aid in attaining this end. For their generous co-operation in this regard we are glad to acknowledge our indebtedness to the following dentists: Drs. H. W. Gillett, J. Morgan Howe, E. M. Kaplan, A. H. Merritt, S. H. McNaughton, T. W. Onderdonk, Karl C. Smith, also Dr. F. P. Simpson of Pittsfield, Mass. and Dr. J. A. Woodward of Philadelphia. We also are indebted to the first year students of medicine at the Columbia Medical School (1911-1912), who cheerfully furnished saliva upon request.

Bottles containing toluol were sent to the dentists, who collected the saliva during operations by using the ordinary saliva ejector and inserting a bottle between the ejector and the suction pump. The saliva was kept frozen in a cold room until a fairly large amount was received.

Precipitation with Acetic Acid. The mucin from about 10 liters of saliva was obtained by precipitation with acetic acid.

One cc. of glacial acetic acid was used for each 100 cc. of saliva. The mixture was then dialysed with frequent changes of water until precipitation was complete. The liquid was siphoned off, the mucin flushed into a beaker and allowed to settle. The liquid was again siphoned off, the mucin stirred up with water to remove the adherent acid as much as possible and again allowed to settle out. After removal of the water the moist material was smeared on a glass plate and dried before the fan.

Yield of crude mucin, 1.5 gms.

Precipitation with Ammonium Sulfate. Ammonium sulfate to saturation was added to about six liters of filtered saliva. The mucin salt together with the small amount of other proteins present rose completely to the top of the mixture. It was skimmed off and drained from the solution on hardened filter paper. It was then dissolved in a small amount of water and dialysed until free from sulfate (10 days). The solution was filtered and precipitated by pouring into eight volumes of alcohol containing NaCl. After standing over night the precipitate settled out, was filtered off, washed with ether and dried.

Yield of crude mucin, 0.47 gm.

3. *Preparation of Mucin Salts from Pure Mucin.*

Preliminary Observations. Before attempting to prepare large amounts of mucin salts a number of experiments were performed to give a clue to the most satisfactory method to employ. A small amount of the mucin powder was rubbed up in a mortar with 0.5 per cent. NaHCO_3 solution. It dissolved readily to a slimy solution, alkaline to litmus and phenolphthalein. After precipitation with alcohol or 1:1 ether-alcohol mixture the precipitate redissolved in water to a clear mucilaginous solution. The alcohol-precipitated product was alkaline to litmus and neutral to phenolphthalein, the ether-alcohol one was strongly alkaline to both.

The effect of long continued dialysis gave a series of interesting results. On the second day the solution in the bag was more strongly alkaline to both litmus and phenolphthalein than the original NaHCO_3 solution. After 36 hours it was faintly alkaline to litmus and neutral to phenolphthalein. A portion was promptly precipitated by ether-alcohol mixture but by alcohol

only after the addition of NaCl. The precipitate dissolved in water giving a characteristic solution. Precipitation occurred in the dialysing bag after three days' dialysis. This was filtered off and the filtrate was further dialysed. On the fifth day it was acid to phenolphthalein and neutral to litmus. On the sixth day it was acid to both indicators, and on the seventh a flocculent precipitate settled out. This was filtered off on the eighth day; the filtrate gave a very faint response when tested with the biuret reagent; the precipitate was insoluble in water, but dissolved readily in NaHCO_3 solution. These results indicate that the sodium salt of mucin can be completely hydrolysed on long continued dialysis, the sodium being split off and removed, and the acid mucin precipitated.

Preparation of the Sodium Salt from Preparation IV. All of preparation IV (11 gms.) was triturated in a mortar with 0.5 per cent. NaHCO_3 solution. Solution was slow giving a thick mucilaginous mass. After standing over night it was poured into about 10 volumes of alcohol, which had been made alkaline to remove organic acids and had then been distilled. Partial precipitation occurred immediately and practically complete precipitation after the addition of NaCl solution. After standing in contact with the alcohol over night the precipitate was filtered off, giving a clear filtrate which was not further precipitated by treatment with more NaCl, alcohol or ether. After pressing with filter paper to remove most of the adherent alcohol, the precipitate was rubbed up with water and redissolved in 0.5 per cent. NaHCO_3 solution. It was precipitated the second time with 5 volumes of alcohol, and came down as usual on the addition of NaCl in moderate amount. After standing over night the alcohol was poured off and the product filtered. It was shaken with ether for the removal of the alcohol. It was expected that after two treatments with NaHCO_3 solution the substance would be completely soluble in water. It was, therefore, rubbed up with about 500 cc. of water, but the expected solution did not occur completely. Addition of NaHCO_3 solution did not have any appreciable effect. Finally, enough 10 per cent. bicarbonate solution was added to bring up the concentration of the solution to 0.5 per cent. NaHCO_3 .

Even then solution was not complete, even on long standing. It was evident that some change in the nature of the substance had occurred, possibly through the influence of long contact with alcohol.

A repetition of the experiment with 1 gm. of preparation III gave essentially the same results. It became evident that this method could not be used satisfactorily for the preparation of mucin salts which would be completely water soluble.

Before giving up the method further experiments were conducted, using 0.1 per cent. NaOH solution, 0.5 per cent. Na_2CO_3 solution, and 0.5 per cent. NaHCO_3 solution, the experiments running parallel. Using 50 cc. of the NaOH solution, 0.5 gm. of preparation III dissolved to a nearly water clear solution. After the second precipitation with alcohol the product was not readily soluble in NaOH. On dialysis it gradually cleared after 24 hours. After again precipitating with alcohol and drying, the salt was only partially soluble in water. Acetic acid threw down a flocculent precipitate instead of the typical stringy mucin masses, showing that even 0.1 per cent. NaOH solution had changed the structure of the mucin molecule. A similar result was obtained when the Na_2CO_3 solution was used and the third trial with NaHCO_3 solution resulted as had the other two.

Method Adopted for the Preparation for Mucin Salts. In the method finally adopted, there is but one precipitation with alcohol, and the mucin salt remains in contact with the alcohol only so long as is necessary for complete sedimentation.

In a preliminary experiment 0.25 gm. of preparation III was ground up in small portions with 25 cc. of 0.5 per cent. NaHCO_3 solution, and to the mixture was added 6 cc. of 0.5 per cent. Na_2CO_3 solution, and 3 cc. of 0.1 per cent. NaOH solution. After standing over night, 12 cc. of the NaOH solution was added, and the solution dialysed until it no longer reacted alkaline to phenolphthalein. It was precipitated by 8 volumes of alcohol, plus 20 drops of 20 per cent. NaCl solution. After filtration it was washed with 60 per cent. alcohol, but there was immediate swelling and partial solution, so that it was necessary to employ 95 per cent. alcohol for washing the precipi-

tate. The alcohol was removed as usual by treatment with ether. The dried product was completely soluble in water giving a slimy mucilaginous solution. Acetic acid threw down the typical stringy mucin precipitate:

The method of preparation of water soluble mucin salts is essentially as follows: One part of mucin powder is rubbed up in a mortar in small portions, with 100 parts of a 0.5 per cent. NaHCO_3 solution. To the mixture are added 10 parts of 0.5 per cent. Na_2CO_3 solution, and, after standing over night, 10 parts of 0.1 per cent. NaOH solution. The solution is then strained through silk, and dialysed in parchment bags until alkaline to litmus and faintly acid to phenolphthalein. The mucin salt is precipitated by pouring the dialysed solution into 8 volumes of *neutral* 95 per cent. alcohol, to which is added several cc. of 20 per cent. NaCl solution to bring about complete precipitation. Flocculation is favored by vigorous shaking. The precipitate is allowed to settle, and is filtered after pouring off the supernatant liquid. The chlorids are removed by washing with about 90 per cent. alcohol. After treatment with alcohol and ether the product is dried in a vacuum dessicator over sulfuric acid.

Preparation of the Sodium Salt from Preparation III. Five grams of preparation III were converted into the sodium salt by the method outlined above. The product was completely soluble in water, giving a solution acid to phenolphthalein and very faintly alkaline to litmus. The dried powder reacted decidedly alkaline when placed on moist red litmus paper. The solution gave positive reactions when subjected to the biuret, xanthoproteic, Millon, Hopkins-Cole, and Molisch tests. The product was compact and slightly brownish in color.

Yield, 3.75 gms.; ash, 3.27 per cent.; nitrogen, 12.20 per cent.; nitrogen, ash free, 12.61 per cent.

Preparation of the Sodium Salt from Preparation II. The sodium salt of preparation II was made, using 1.15 gms. of mucin. The dialysed solution was somewhat thicker than the corresponding solution of preparation III. The product dried to a white, very light, fluffy powder.

Yield, 0.87 gm.; ash, 3.11 per cent.; nitrogen, 12.44 per cent.; nitrogen, ash free, 12.84 per cent.

Preparation of the Potassium Salt from Preparation III. Two grams of preparation III were ground up in a mortar in small portions with 200 cc. of 0.5 per cent. KHCO_3 solution, to which was added 20 cc. of a 0.5 per cent. K_2CO_3 solution. The solution was much thicker than corresponding NaHCO_3 solutions. After standing over night 20 cc. of 0.1 per cent. KOH solution was added. The solution was strained, dialysed, and precipitated in the usual manner.

Yield, 1.6 gms.; ash, 3.18 per cent.; nitrogen, 12.54 per cent.; nitrogen, ash free, 12.95 per cent.

4. *Preparation of Sodium Mucinate Directly from Submaxillary Glands.*

In order to obtain relatively large yields of sodium mucinate, the salt was prepared directly from the gland extracts without first completely purifying and drying the mucin itself. The glands were extracted in the usual manner, and the mucin twice precipitated by pouring the 0.15 per cent. HCl solution into four volumes of water. The moist mucin mass was then dissolved by vigorous stirring in a large volume of 0.5 per cent. NaHCO_3 solution, to which was added one-tenth its volume of 0.5 per cent. Na_2CO_3 solution. The solution was then strained through silk. After passing through the silk the previously undissolved mucin lumps readily passed into solution. After standing over night 0.1 per cent. NaOH solution, equal in amount to the quantity of Na_2CO_3 solution used, was added, and the solution was dialysed as usual until no longer alkaline to phenolphthalein. The salt was precipitated by six volumes of alcohol, plus several cc. of 20 per cent. NaCl solution. After washing with alcohol and ether the salt was dried in a vacuum dessicator.

Preparation V., Sodium Salt. 1650 gms. of glands were extracted over night with eight volumes of water plus chloroform. The mucin was twice precipitated in the usual manner, and then dissolved in one liter of 0.5 per cent. NaHCO_3 solution, 100 cc. of 0.5 per cent. Na_2CO_3 solution, and 100 cc. of 0.1 per cent. NaOH solution. Dialysis proceeded for 54 hours. The salt was repeatedly washed with about 90 per cent. alcohol until free from chlorin. The dried powder was not completely soluble in water,

possibly due to a denaturising effect of long continued contact with the alcohol used in washing out the chlorid. The powder and its water solution were alkaline to litmus, and the solution gave a stringy precipitate with acetic acid.

Yield, 13 gms.; ash, 2.70 per cent.; nitrogen, 12.63 per cent.; nitrogen, ash free, 12.98 per cent.

Preparation VI., Sodium Salt. The mucin from an extract of 1250 gms. of glands was twice precipitated and dissolved to a clear solution in 900 cc. of bicarbonate solution and 100 cc. of Na_2CO_3 solution. No 0.1 per cent. NaOH solution was used in this preparation. Dialysis was continued until the solution was *neutral* to phenolphthalein. The solution was precipitated with six volumes of alcohol, plus 20 per cent. NaCl solution. The salt was washed only two or three times with alcohol as long washing seemed to render preparation V partially insoluble in water. The salt was analyzed for chlorine, and showed only a trace (0.07 per cent.), indicating that the amount of chlorid held by the precipitate is negligible, and that thorough washing with alcohol is not necessary.

Yield, 17 gms.; ash, 3.12 per cent.; nitrogen, 11.58 per cent.; nitrogen, ash free, 11.95 per cent.

In this preparation no NaOH solution was used, and dialysis was carried to the point of neutrality to phenolphthalein. The powder was completely soluble in water.

Preparation VII., Sodium Salt. Extraction and two precipitations of the mucin from 1200 gms. of glands were made in the usual manner. The moist mucin was dissolved in 1700 cc. of 0.5 per cent. NaHCO_3 solution and 150 cc. of 0.5 per cent. Na_2CO_3 solution. No sodium hydrate solution was used. After straining through silk the solution had a somewhat milky appearance. It was allowed to remain in the ice box for 36 hours, and was then dialysed as usual. Dialysis required three days on account of the large dialyser bags used. It was precipitated, washed, and dried in the usual manner. Both the water solution and the powder were alkaline to litmus.

Yield, 13 gms.; ash, 2.70 per cent.; nitrogen, 12.15 per cent.; nitrogen, ash free, 12.49 per cent.

Preparation VIII., Sodium Salt. For this preparation 2300

gms. of glands were extracted and the contained mucin twice precipitated. The moist mucin dissolved completely in 1850 cc. of bicarbonate solution and 180 cc. of normal carbonate solution. The solution was of a very thick consistency. It was dialysed to the very faintest possible alkalinity to phenolphthalein, a mere suggestion of a pink color. The dried powder was completely soluble in water, the solution being faintly alkaline to litmus and giving the typical mucin shreds with acetic acid.

Yield, 21 gms.; ash, 3.12 per cent.; nitrogen, 11.92 per cent.; nitrogen, ash free, 12.30 per cent.

As in preparation VI so in this case, *no* NaOH solution was used, and the dialysis was *not* carried to an *acid* reaction to phenolphthalein. Both preparations are low in nitrogen content.

A summary of the analytical results on mucins and mucin salts is given in Table III.

TABLE III.

Percentage composition of mucins and mucin salts.

Preparation.	Ash.	N.	N (ash free).	S.
I.....	0.31	12.33	12.37	0.59
II.....	0.53	12.36	12.43	0.61
II Na salt.....	3.11	12.44	12.84	
III.....	0.28	12.49	12.53	0.65
III Na salt.....	3.27	12.20	12.61	
III K "	3.18	12.54	12.95	
IV.....	0.37	12.49	12.56	0.55
V Na salt.....	2.70	12.63	12.98	
VI " "	3.12	11.58	11.95	
VII " "	2.70	12.15	12.49	
VIII " "	3.12	11.92	12.30	

In conclusion the author takes pleasure in expressing his gratitude to Prof. William J. Gies for his interest in the work and for his many suggestions which made its completion possible.

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**A STUDY OF NEW GROWTHS AND OTHER LESIONS
OF THE ALVEOLAR PROCESS¹**

BY M. S. MINER, M.D., D.M.D.

The lesions to which this paper will principally confine itself are those which are loosely and indefinitely denominated Epulides, or as we speak of a single lesion, Epulis. This term is a clinical one, and does nothing more than indicate the location of the lesion. It gives us no knowledge concerning the nature of the lesion itself. It is inexact and unscientific, and means nothing more than a lesion on the gum. In other parts of the body, general terms are being discarded as far as possible in favor of very definite ones, and there is no reason why this excellent plan should not be adopted in naming lesions of the alveolar process.

Epulis has meant to the surgeon a new growth more or less malignant in nature; usually a so-called giant-cell sarcoma. To the dentist it has meant any sort of growth in or around the alveolar process, malignant or benign, including not only the fibroma and sarcoma, but the papilloma, the angioma, and the carcinoma as well. To the pathologist the term has no definite meaning. Is it any wonder, then, that the wide application of this term has brought about a state of confusion and inexactness? This confusion and inexactness are also due to the fact that so little attention has been paid to the pathology which is the basis not only of an adequate conception of these lesions, but also for intelligent treatment of them.

It has been a part of our inherited belief that a large percentage of Epulides are giant-cell sarcomata. As a result of this idea, radical operations have been performed, which have permanently disfigured the patient. Many teeth and large portions of the maxillæ have been removed, and many times the wounds have healed in such a way that any sort of mechanical restoration of the parts to repair the mutilation has been practically impossible. If these statements are true (and I believe they are) no one can deny the importance of an exact knowledge of

¹ Read before the Mass. Dental Society, May 2, 1912.

these lesions, which will better enable us to determine just how radical the treatment must be. If it can be shown that the extensive sacrifice of tissue in treatment is unnecessary except in rare cases, many persons may be spared the disfigurement which has resulted so frequently in the past.

The gross appearance of these lesions has been described by various authors, and two clinical forms have been rather sharply differentiated. First, that form which is spoken of as the fibrous type, usually called Fibroma, which is described as a small growth, firm and smooth, and without projections; the mucous membrane of normal appearance, and comparatively non-vascular. Second, the giant-cell Epulis, usually called giant-cell Sarcoma, which is described as having a deeper red color than the fibrous type; a softer consistency; a greater vascularity, with more tendency to bleeding; a greater size, and a more rapid growth. From a clinical standpoint, these descriptions are sufficiently accurate to indicate in a general way the gross appearance of the lesions which we see most commonly. From a pathological standpoint, however, these types cannot be so definitely and sharply differentiated. Furthermore, the study of over fifty cases, upon more than half of which I have personally operated and followed up, leads me to believe that the pathology does not correspond in a large percentage of the cases to the generally accepted idea that these lesions are Fibromata and Giant-cell Sarcomata.

In classifying tumors, or new growths, the most scientific, and yet at the same time the simplest way, is according to the type of cell from which they arise. Accordingly, it simplifies matters greatly when we know that these lesions of the alveolar process, both fibrous and giant-cell type, arise from the same kind of cell—namely, the fibro-blast—which is the ordinary connective tissue cell. The fibroblast appears as a flat cell with an oval nucleus. It produces “two kinds of fibrils; fibroglia and collagen fibrils, the latter forming an intracellular substance.” A tumor of slow growth arising from this cell is called a Fibroma. When the growth is rapid, it is known as a Fibro-sarcoma. The rate of growth determines whether the tumor is benign or malignant. When we consider how great the variation in rate of

DESCRIPTION OF PLATES.

FIGS. 1 to 5 are from experimental lesions obtained in guinea pigs by injection of tartar from mouth.





FIG. 1 (X 35 diameters) -Shows lesion in muscle. Surrounding the lime salts is chronic inflammatory tissue, and many foreign body giant cells.

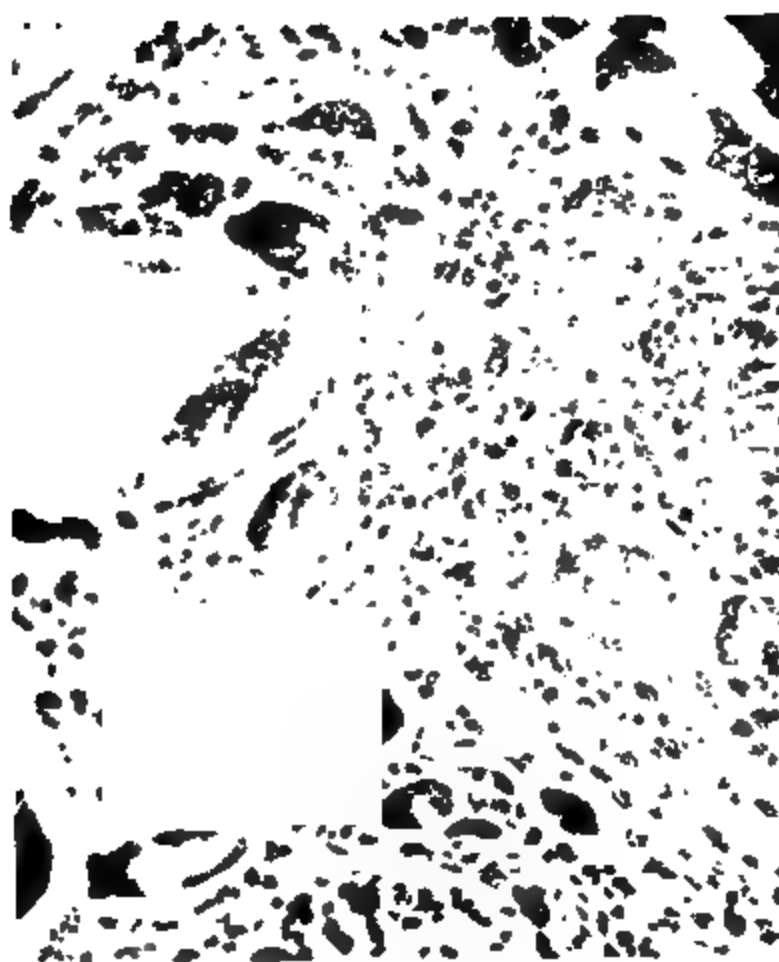


FIG. 3 (X—275 diameters).—Multiple nuclei of giant cells. Surrounding tissue is proliferated fibroblasts with lymphocytes.

FIG. 2 (X—35 diameters).—More extensive proliferation of the fibroblastic element is seen with giant cells present.



FIG. 4 (X-275 diameters)—Shows acute inflammation surrounding the bone salts in addition to elements seen in Fig. 3.



FIG. 5 (X-1000 diameters)—Single giant cell

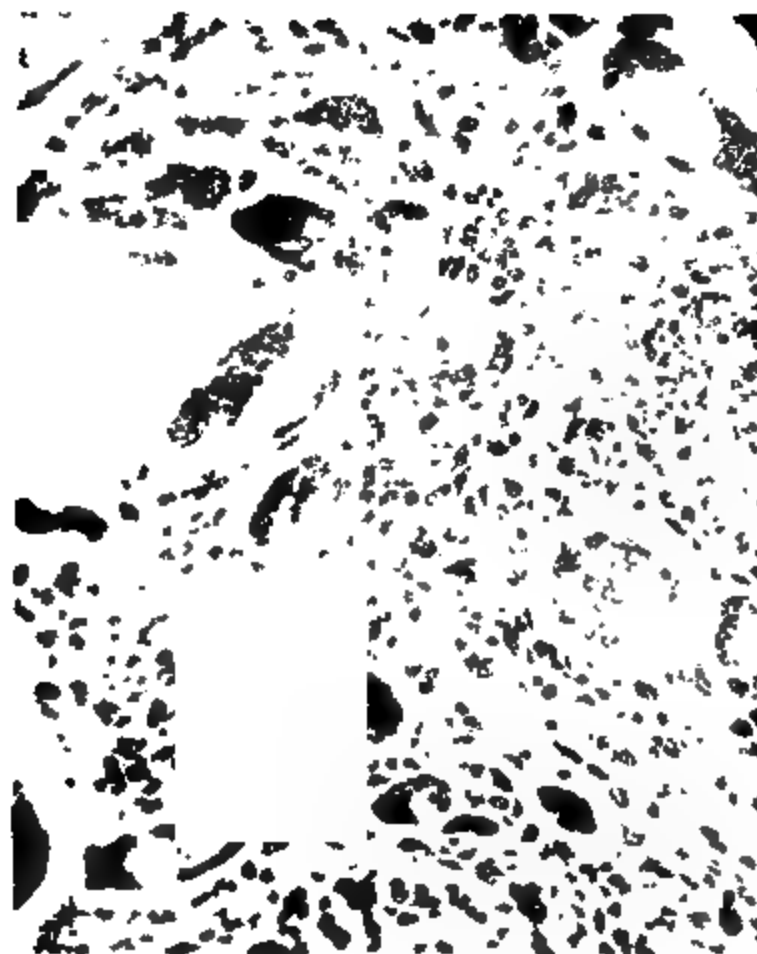


FIG. 2 (X—35 diameters). More extensive proliferation of the fibroblastic element is seen with giant cells present

FIG. 3 (X—175 diameters). Multiple nuclei of giant cells surrounding tissue is proliferated fibroblasts with lymphocytes



FIG. 4 (X=273 diameters)—Shows acute inflammation surrounding the lime salts in addition to elements seen in Fig. 3.



FIG. 5 (X=1000 diameters)—Single giant cell.

fibromata, and showed a slight amount of bone formation. *In all the rest of the cases chronic inflammation tissue predominated*, with usually some acute inflammation at the periphery. In many of the cases, the clinical appearances corresponded very well with either one or the other of the types already described; yet pathologically they were nothing more than inflammatory lesions.

Of the type showing giant-cells and usually called giant-cell sarcoma, the type which is said to be the most common, I found out of the fifty-three cases, but ten. In discussing the pathology of this lesion, first let us not lose sight of the fact mentioned early in the paper, that it arises from the fibroblast. This connective tissue element is the important part of the growth. As I shall soon show, the giant-cells, while they present a striking microscopical picture, are nevertheless of secondary importance. It has been shown (Giant-cell Sarcoma, F. B. Mallory, M.D., "Journal of Medical Research," Vol. XXIV., No. 2) that two types of giant-cells occur in tumors. First, the tumor giant-cell which arises from multiple mitosis, and which is a true tumor cell. Second, the foreign body giant-cell, which is formed by the fusion of endothelial leucocytes, and which is not a tumor cell at all. In all the cases studied, it was the foreign body giant-cell that was present, the tumor giant-cell not appearing in a single instance.

The foreign body giant-cell is a large irregular shaped cell, the cytoplasm of which is well defined. It has many nuclei, which stain deeply, and which are also sharply defined. These cells are formed as has been said, by the fusion of endothelial leucocytes, and are found not only in tumors, but appear in inflammatory tissue as well. When they appear in true tumors, they are of no consequence, as has been said, so far as the tumor formation is concerned. The endothelial leucocyte, which is a large mononuclear cell in the blood, is attracted into all sorts of lesions, by various substances, chiefly fat and lime salts, which may act as irritants. As they gather in numbers, they tend to fuse around the substance which has attracted them, provided it is difficult of solution, and form these foreign body giant-cells.

With this idea as a starting point, I performed some ex-



FIG. 8—Photo.

FIG. 9 (X—35 diameters)—Section from above—acute and chronic inflammation Proliferation of fibroblasts.

FIG 10 (X—275 diameters) —Shows bundles of fibroblasts together
—many lymphocytes—chronic inflammation

periments to see whether or not the irritation from the calcareous deposits of the teeth could produce these phenomena. Ordinary tartar was finely powdered, and a heavy suspension was made with normal saline. Of this suspension, one and a half cubic centimeters were injected into a shoulder of several different guinea pigs. In the first experiments the tartar was not sterilized, but was injected with ordinary sterile precautions. Several pigs died, and most of them developed well marked abscesses more or less localized. In the second series, the tartar was carefully sterilized with dry heat for an hour before making the suspension, and the injections were made with sterile precautions. The results will best be demonstrated by the plates, which show how almost identical, microscopically, these experimental lesions are, with some of those found in the mouth.

The pathology seems to be briefly, this. First, the injury to the tissues causes an acute reaction which brings poly-nuclear leucocytes to the region. Then the irritation of the foreign body (in these experiments the tartar) results in attracting many endothelial leucocytes, some of which fuse and form foreign body giant-cells. In addition to this, the fibroblasts begin to proliferate and form new connective tissue. The whole picture as it appears under the microscope, looks strikingly like what has hitherto been regarded as giant-cell sarcoma.

That pathologists have been wrong in regarding these giant-cells as usually indicating tumor formation, has been shown but recently. It is probably true that many diagnoses of giant-cell sarcoma have been made, which were nothing more than an accumulation of foreign body giant-cells and some proliferated connective tissue.

Of the ten cases studied, six were not true tumors. These cases, aside from the giant-cells, showed granulation tissue and chronic inflammation. Three cases could fairly be called fibrosarcomata. The remaining case was also probably a true fibrosarcoma, but it was extremely difficult to decide with positive assurance.

In the face of these facts, and with the knowledge that these lesions, even when they are rapidly growing fibrosarcomata, do not form metastatic growths elsewhere, it seems to me we are not

justified in radical operative procedure, which removes large portions of the jaws adjacent to these growths, as is not infrequently done. Moreover, it is our duty to our patients to give them a chance, especially where a radical removal is going to disfigure the patient. It has been my experience that a thorough removal of the growth itself, and a thorough curetting at the base of the lesion, using a surgical burr where it is necessary, is quite sufficient. In none of the cases that I have operated on in this way has there been any return of the lesion so far as I know. In a few cases I felt it advisable to remove a tooth in order to get more thoroughly at the base of the lesion, but even this ought not to be necessary very often. Of course, cases should be kept under observation, and, in the event of any return, more radical treatment can be given. The recurrence of a lesion does not necessarily indicate malignancy, however.

We know that Fibroma does recur occasionally when it has not been completely removed.

It goes without saying, that in addition to this treatment, the removal of anything that may be acting as an irritant is necessary. In three or four of my cases, the edge of a gold crown running too far down under the gum at one point seemed to be a possible etiological factor. Two cases presented amalgam fillings jammed down into the interproximal space.

In the matter of differential diagnosis the fact must be recognized, that lesions other than those which have been discussed, do occur. Carcinoma and some of the more malignant forms of sarcoma are occasionally met with. These tumors, however, are not so sharply localized, as the lesions to which this paper is especially concerned, and they are sufficiently different in their microscopical appearance, and in their clinical history, so that error in diagnosis should not be frequent.

There is, however, one lesion of the alveolar tissue due to a systematic disturbance, that is comparatively rare, but which might be taken for the giant-cell type of growth. I refer to the change in the gum tissue produced by a myelogenous leukemia. In this condition the gums are very spongy, and bleed very easily, due to the invasion of the tissue by myelocytes. There may be considerable swelling, which appears not unlike new growths.

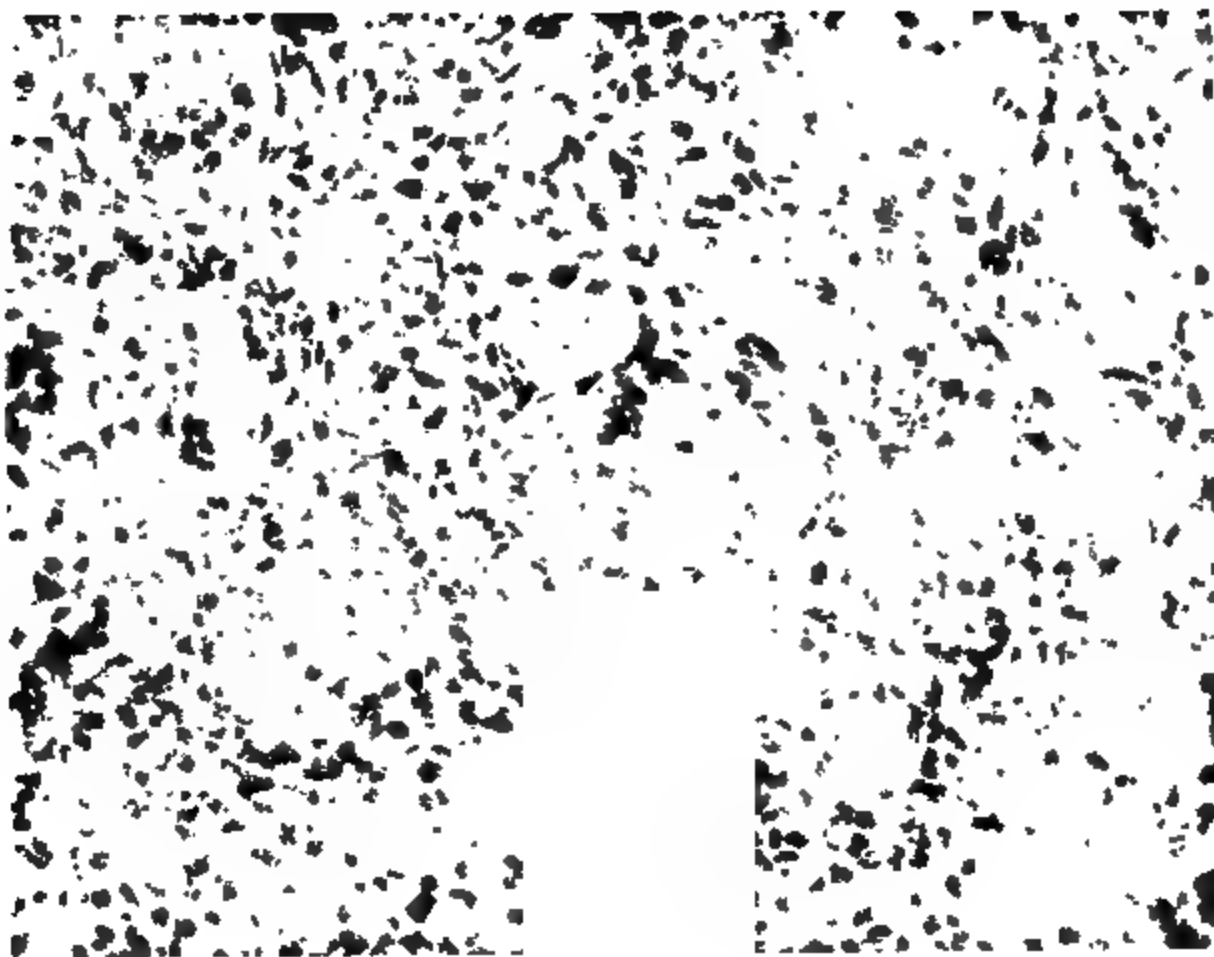


FIG. 12 (X—275 diameters)—Section—true fibro sarcoma—no inflammatory cells—pure fibroblasts between giant cells. Giant cells of no importance in growth.

FIG. 11—Photo.

FIG. 13 (X—224 diameters)—Clinical diagnosis of this case—
Fibroma Microscopically almost pure granulation tissue.

FIG. 14 (X—38 diameters)—Granulation tissue with many blood
vessels Clinical diagnosis was giant cell sarcoma.

These cases are usually fatal, and there should be little difficulty in making the diagnosis.

SUMMARY AND CONCLUSIONS.

1. The term Epulis should be substituted so far as possible, by terms which more exactly describe this variety of lesion.

2. Lesions in the alveolar process in a large percentage of cases are not malignant.

3. The so-called Giant-cell Sarcoma in this region, in more than half of the cases is nothing more than an inflammatory lesion.

4. The Giant-cells are of no importance in diagnosis, the cell from which the tumor arises being the important one.

5. Experimental lesions simulating those found in the mouth, can be made by introducing an insoluble irritant into guinea pigs.

6. Reasonably conservative treatment of lesions of the alveolar process may be pursued, with no great danger to the patient.

I gratefully acknowledge my indebtedness to Prof. Mallory and Dr. Burgess, of the Boston City Hospital, for their assistance in this work.

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RADIOGRAPHY AS AN ESSENTIAL PART OF OFFICE PRACTICE¹

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It is the belief of the essayist that no operator is justified in claiming to be a successful practitioner of dentistry who does not make radiography a part of his office routine. It can easily be demonstrated that the operator who relies alone upon his senses of sight and touch in performing some of his operations, must of necessity fail to attain the success which could have been achieved had he used radiography to assist in outlining his work. Failing to succeed in as large a percentage of operations as is possible deprives one of the justification to call one's self a successful operator. I will endeavor to substantiate my belief by going over the various types of cases in which radiography eliminates the possibility of error in diagnosis or marks out for us the course we are to pursue in our operative technique, and it will leave as the only class of cases coming to the general practitioner of operative dentistry which does not call for radiographic aid, that requiring only simple cavity preparation (which includes treatment) and filling. Later I will take up and discuss the reasons given by those who have failed to make radiography part of their office routine for not doing so. I will show you slides of cases where the operators failed in their work and were ignorant of their failures, whereas the radiographs will make them clear to you all (Figs. 1-7). I will also show you slides where the radiograph either simplified the operative problem by disclosing in advance all obstacles to be met or discovered conditions of which both patient and operator were unaware.

There presents to the general practitioner of operative dentistry, other than simple carious cavities, the following broad divisions of cases:

Cases of Pyorrhea Alveolaris.

Cases of Abscess formations, blind or fistulous.

Cases of Antrum Involvement.

¹ Read before the Metropolitan District of the Massachusetts Dental Society, Boston, Mass.

Cases of Necrosed root apicies.

Cases of Fracture.

Cases of Alveolar Necrosis.

Cases of Trigeminal Neuralgia and Tic Douloureux.

Cases of Impacted teeth.

Cases of Orthodontia.

Cases involving the pulp and calling for its extirpation.

In Pyorrheal cases the question as to the advisability of the extraction or splinting of teeth, depending upon the extent of alveolar absorption, can only be decided with certainty after a good radiograph has been obtained of the teeth in question.

The exact location of the focus of infection in extensive abscess formations can often only be positively determined by means of the radiograph. The presence of a blind abscess or a necrosed root apex can only be determined with certainty by the same means.

In cases of Neuralgia, Tic Douloureux or antrum involvement, the first step to be taken should be the discovery or elimination of the possibility of dental origin. This can only be done with certainty by means of the radiograph.

The presence and position, if present, of unerupted teeth, the knowledge of which is so important in our orthodontia work, can only be disclosed with certainty through the use of radiography.

Impacted teeth often require the use of the radiograph to be discovered, and the extent of their impaction always requires radiographic outlining.

The extent of fractures and the best methods to pursue in their reduction are disclosed with certainty by means of the radiograph alone.

Every detail in our work of opening pulp canals is made clear by this means.

We see, then, that of all our operative work, we can only prepare and fill simple carious cavities without radiographic aid, if we wish to be certain of our operations.

As root-work takes up so large a part of the dental operator's time, I will give you a description of the radiographic routine of this work as established in the office of the essayist.

Before endeavoring to do any root-work, we invariably take a radiograph of the tooth upon which we are going to operate, and so discover exactly what our problem is. Having obtained a good radiograph we use it as a guide in opening up the pulp chamber and canal. When we feel we have reached the apex of the root, or that we have gone as far as possible without danger, we place binding wire of about 28 gauge in the canal and closing the crown cavity with gutta-percha, take a second radiograph. This will either show that we have opened the canal to the apex, or how far we still must go to reach that point. Should we find our wire has reached the apex, we are ready to proceed with root preparation, sterilization, and filling. Should our wire fail to reach the root-apex, we continue in our attempt to open up the canal, using our second radiograph as a guide. When we feel we have opened up the part that remained after the first attempt, we again place the binding wire in the canal and take a radiograph as before. Having finally succeeded in opening the canal to the apex, we proceed to preparation, sterilization, and filling. After filling, which we do with gutta-percha points, we invariably take a radiograph of the filled root. This I consider absolutely necessary. We sometimes discover that our filling material has failed to reach the apex of so simple a root as a straight superior central! When the radiograph shows our filling has reached the apex of the root, we are attempting to fill, we can then go on with our crown restoration, knowing we are building upon an absolutely sound foundation. Should we find ourselves unable to succeed in making a perfect root-filling, we fill all of the root we can and amputate the portion it is found impossible to fill. Root-amputation (Apectomy), with the assistance of a good radiograph which locates exactly the portion of the root we desire to remove and a good local anesthetic which renders the operation painless, is a comparatively simple task.

The slides I will show you later (Figs. 1-7) indicate that serious attempts have been made to fill properly the roots shown. Had radiographs been taken after these root-fillings had been inserted, these resulting abscesses would have been avoided.

In regard to the subject of distortion, about which so much is heard, in root-work it does not present a very serious obstacle.

If your wire is shown to have reached the root apex, no matter how great the distortion (Fig. 15) of the radiograph, you are sure that you have succeeded in opening up your canal properly. If, however, your wire is shown to have failed to reach the apex, is it not a simple matter to measure your wire against the shadow it has made on the film and thus gauge the amount of distortion? In diagnostic work distortion is a more serious obstacle. In order to avoid errors in diagnosis where we find ourselves unable to eliminate distortion, we take two or three radiographs from different angles, and by comparing them reduce the possibility of error from this cause to an almost negligible quantity.

From the foregoing remarks it will be seen that with the exception of one class of cases, all our operations call for the use of radiography, in order to eliminate error in diagnosis or treatment, and yet but a very small percentage of dental operators have made radiography part of their office routine. The reasons given for not doing so, are broadly as follows:

Ignorance of technique.

Fear of the danger from overexposure to the X-ray, either as regards the patient or operator.

The claim that in the "necessary cases" the operator sends his patient to a specialist to have what he deems the necessary radiographs taken.

Inability to secure "sufficient remuneration" for special service, so-called.

For the benefit of those who fall in the first class, I would state that the technique necessary for practising dental radiography successfully is easily acquired.

Having a suitable outfit (these I am told can be purchased as cheaply as \$150.) one must first learn to recognize the varying conditions of the tube and the methods whereby these conditions are obtained. Tubes are said to be hard when the vacuum is high and the penetrability great. They are said to be soft when the vacuum is low and the penetrating power slight. The difference between these conditions can be easily recognized, and can be quickly taught by the manufacturer, as can also be the methods of regulating the tube. The focusing of the tube is also easily learned.

In dental radiography we use small films, which may easily be placed in any part of the mouth. To-day the best films for this work, in the opinion of the essayist, are those put up by the Eastman Kodak Company, of Rochester, N. Y., and are known as the Transparent Positive Film for Dental X-ray Work. They come packed two in each package, 36 packages in a box, and are sold at \$1.50 per box. The reason given by the Eastman Company for this method of packing, is that it saves the necessity of re-exposing the patient should there be any failure in the developing of one of the films. This method of film packing was first suggested to the Eastman Company by Dr. D. M. Clapp, of Boston, Mass. The sensitive side of the films is on the plain black side of the film package. In making an exposure, we place the black side of the film pack against the part to be radiographed, having that part between the tube and the film pack. The time of exposure varies in accordance with the hardness of the tube, and ranges from the flash in the case of the most powerful apparatus, to 20 or 25 seconds in the case of the less powerful ones. The matter of deciding as to the proper length of time of exposure necessary to obtain a good radiograph will be quickly learned from experience. The developing of these films has also been simplified by the Eastman Company. The essayist has obtained the best results from the use of Eastman's Special Developer Powders. These powders come in cartons containing six, and are sold at 25 cents per carton. To prepare the developer, dissolve the contents of a single powder package which contains two powders, one red the other blue, in four ounces of water of a temperature of less than 70 degrees F. For a fixing solution, the essayist used Eastman's Acid Hypo-sulphide of Soda and Velox Hardiner, mixing them in a solution of distilled water, 16 ounces; Hypo-sulphide of Soda, 4 ounces, and Velox Hardiner, 1 ounce. The Hypo-sulphide of Soda costs 12 cents a pound, and the Velox Hardiner comes in 4-ounce bottles and sells for 25 cents. This fixing solution can be used over and over again until it acquires a dark brown color when it should be discarded.

Having prepared your developer and filled a small tray with fixing solution you can now proceed with developing, which is

done in the usual photographic dark room. Having excluded all light other than that of the ruby lamp, you open your film-pack and place the two films separately in the developing solution. In doing so, it is advisable to do this with a sliding motion, and at an angle in order to avoid the possibility of any air bubbles clinging to the under side of the films. Having placed your films in the developer, you vibrate the tray constantly in order to continually bring fresh developer in contact with them. If proper exposure has been made, you will find your films are fully developed in about three minutes. Having decided that the films have been developed up to the proper point, you remove them from the developer, wash them for a minute or two in cold running water, and place them in the fixing bath where they are to remain until properly fixed. This fixing will take place in from 10 to 20 minutes. After fixing, the films are allowed to remain in running cold water for about 30 minutes and then dried. In handling the films, care must be taken to avoid scratching them.

From this description it will be seen that the technique of dental radiography is one that can easily be acquired.

In regard to the danger from overexposure to the X-ray in dental radiography, as regards the patient, I may say that it is non-existent. In all my experience with radiography, covering a period of over nine years, I have never heard of a patient suffering from a burn as a result of being overexposed to the X-ray while having dental radiography done.

As regards the operator, there is a very real danger, but with proper precautions, such as tube shields, protective screens, gloves and aprons, and film or plate holders this is practically eliminated.

We now come to the operators who "send out their radiographic cases." In root-work, to follow such a routine as I have described, the charges of a radiographic specialist would be prohibitive in all but a few instances. In diagnostic work, in exceptional cases, this class of operators may send their patients to a specialist to have radiographs made before attempting to make a positive diagnosis, but my experience has been that the patients are usually sent to the radiographic specialist after some form

of treatment has been attempted, and its failure to give the desired relief has demonstrated to the operator that he has made an error in diagnosis, operative technique, treatment, or prognosis. Whenever these men attempt to perform any operation other than simple cavity preparation and filling, they are taking chances which they could eliminate to a great extent, and in so far as they fail where they might have succeeded had they had radiographs to guide them, just so far are they culpable. They must not take the chance first, and the radiograph afterward, they must be taught again that the ounce of prevention is far better than the pound of cure.

Of the large class of practitioners who fail to make radiography part of their office routine because they cannot secure additional remuneration for what they deem special service, there remains little to be said. ANY MAN WHO PRACTISES HIS PROFESSION WITH THE IDEA OF GIVING SERVICE IN ACCORDANCE WITH THE SIZE OF THE FEE, in the opinion of the essayist, SHOULD BE DEPRIVED OF HIS LICENSE TO PRACTISE. Appealing to this class from a purely commercial standpoint, I might add that it pays to give your clientele the best service within your power, no matter what the fee. I can only ask them to try it, and am sure they will be speedily convinced.

I will now show you some slides of cases (Figs. 1-7), every one of which will show an abscess formation as the result of imperfect root-work, and in each instance you will recognize the fact that the operator would have been able to avoid this resulting trouble had he taken a radiograph after inserting his root-filling. He would have clearly seen the imperfection of his work, and could then have easily given more nearly perfect service.

Fig. 8 shows an abscess and the roots of the affected tooth opened for the treatment of this condition. The guide wires, showing how well these roots have been opened, will be seen in place.

Figs. 9 and 10 show two superior second bicuspid, both showing abscess formations in their alveoli, the roots of which could never have been successfully treated and filled without radiographs to guide the operator.

Fig. 11 shows a right superior first bicuspid with guide wires

FIG. 1.

FIG. 2

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

FIG. 13

FIG. 14

FIG. 15

FIG. 16.

FIG. 17.

FIG. 18.

FIG. 19.

FIG. 20

FIG. 21.

FIG. 22.

FIG. 23

FIG. 24

FIG. 25

in the opened canals, and a blind abscess on the root of the cuspid. The patient had not complained of any trouble in this cuspid, and this condition would have escaped notice were it not for the fact that the pulp of the first bicuspid had become infected necessitating its extirpation. The cuspid was carrying a porcelain faced crown, and the pulp had evidently not been removed before the crown was inserted.

Fig. 12 shows a case of extensive abscess involvement. Patient presented with a considerable swelling of the lower right side of the face, the second molar was badly broken down, the first molar was carrying a gold shell crowned and was slightly loosened. Patient complained of pain, only in the second molar, but the radiograph shows both teeth to be affected. Note the curve of the anterior root of the second molar. Fig. 13 will show how, with Fig. 12 to guide us, we were able to open up this canal.

Fig. 14 shows an abscessed condition of the alveoli of two of the inferior incisors. Fig. 15, with the guide wires showing at the apicies of the roots, and, although distortion is present, the fact that these canals are properly opened is readily seen.

Fig. 16. This patient had been suffering from trigeminal neuralgia for fourteen years, and had been treated with innumerable injections of alcohol and alcohol and ether without relief. When she presented, we took several radiographs of the affected side, and discovered a decomposing root of the left superior third molar, which was removed. No relief was obtained from the extraction of this root. The roots of the left superior central and lateral not showing any root fillings, and the history of the case not being clear as to whether or not the neuralgia occurred prior to or after the insertion of these crowns, and the appearance of the alveoli being suspicious, these crowns were removed. No relief was obtained from the treatment of these two roots, and their extraction was decided upon. Following the extraction, the sockets were thoroughly curetted. Almost immediate relief was obtained following this treatment, and since this time, a period of over two years has elapsed without a recurrence of the neuralgia. This case emphasizes the necessity of discovering whether or not there is any dental in-

volvement in all cases of neuralgia before any form of treatment is decided on.

Fig. 17. Patient, a man of 32 years, presented with a temperature of 101.1 degrees F. Complained of pain upon swallowing. Had been running a temperature for over two weeks. Right inferior third molar was fully erupted, and upon thermal tests being made, was found to have a vital pulp. Radiograph showed an area of infection spreading down the anterior surface of the anterior root and terminating in a circumscribed area about the apex of this root. This case was diagnosed as an infection from food debris, which had lodged in the inverted V-shaped space between the second and third molars. The extraction of this third molar and the curetting of its socket resulted in a speedy and uneventful recovery.

Fig. 18. This case was one of typical blind abscess. While it was possible to have diagnosed this case as a possible blind abscess from the subjective symptoms, which were described as a constant soreness of this tooth, an absolute diagnosis could only be made by means of the radiograph. You will note that the area of infection is small. I would also call your attention to the overlapping edges of the inlays in the first bicuspid and the first molar.

Fig. 19. This case was a particularly aggravated one. This patient, a young woman of 24, presented with a fistula opening on the cheek. The cause of the trouble can easily be seen to be an imperfect root-filling in what should be a very simple root to fill. Had the operator had radiographs to guide him in his work, and had he taken a radiograph of the completed root-filling before inserting his crown filling, this patient would have been spared the disfigurement of a facial scar.

Fig. 20. This slide is of a patient, age 45, who presented himself with the request that some prosthetic appliance be inserted to supply the deficiency caused by the loss of the right superior cuspid, second bicuspid, and first molar. Over the right cuspid socket the mucous membrane was considerably inflamed, and a probe passed through the inflamed tissue indicated the presence of some necrotic substance. It was suspected that a portion of the missing cuspid still remained in the alveolus, and its

extraction was advised before attempting any restoration. A radiograph was taken to guide the extractor in his work, and instead of a root it showed a small necrotic alveolar exfoliation to be present, and above it could be seen the outline of the cusp of the missing cuspid tooth. A second radiograph (Fig. 21) was taken, and it shows the cuspid to be impacted and lying across the roof of the mouth, with the cusp just below and posterior to the apex of the lateral root. As the patient had never suffered discomfort from the impaction of this cuspid, it was decided to remove only the necrotic exfoliation and to allow the cuspid to remain as discovered. This was done, and the restoration of the missing teeth was then completed by means of a removable bridge.

Fig. 22. This slide shows a horizontally impacted third molar, which was discovered accidentally. This case was being treated for Pyorrhea, and the radiograph was taken to discover the exact condition of the first and second molar roots and sockets. Fig. 23 shows the case after the extraction of this impacted tooth.

Fig. 24. This slide is interesting, simply to show how our medical brethren often overlook the dental origin of some of the ailments which present themselves to the general medical practitioner for relief. (Levy, *Medical Review of Reviews*, June, 1912, p. 402.) This patient came to my office for prophylactic treatment prior to having a tonsillotomy performed. This operation had been decided upon in the hope of giving relief from a supposed attack of rheumatism of the muscles of the neck for which she had been treated for a period of two years. The symptoms were so typical of an impacted third molar that we advised the patient to allow us to take a radiograph of the "rheumatic side." The discovery of this impacted third molar resulted, and upon its removal the "rheumatic" condition subsided.

Fig. 25. This slide illustrates another case where the patient was being treated by a specialist for throat trouble. The radiograph shows a typical impacted third molar, the removal of which caused a prompt disappearance of the "throat trouble."

**ELECTRO-DEPOSITED METALLIC MATRICES FOR
INLAY WORK¹**

BY DR. A. F. HAMILTON, BOSTON.

I have always been interested in porcelain work, making my first inlays by grinding pieces of artificial teeth to fit the cavities, and over thirty years ago made inlays fused in a coke-burning furnace, which were good looking, but not having a matrix, the fit was poor.

Ten years ago, thinking it should be specialized, I sent my brother to Dr. Wassall in Chicago, who was doing the best work I had seen, to learn his methods, and since that time my brother and two trained assistants have been at work in my laboratory principally on porcelain. We have worked out many methods, some of them differing from those commonly used, and which I hope may interest you this evening.

We soon decided in favor of the impression method, partly because it was more suited to laboratory work, and partly because it gave better results with less work. The first inlays were made by burnishing the matrix in the tooth cavity, and to do this successfully the cavity had to be shaped with very definite walls, and the floor flat and smooth. In consequence of this there was little retention, and to get more hold, and yet keep the smooth floor, some dentists mutilated teeth in the endeavor to get dove-tails, following attractive pictures in the magazines, but doing harm to the cause of porcelain inlays.

My present method is to remove decay, and to cut the strong walls. When this is done it usually will be found that the floor is uneven and that there are depressions or angles, so that no further retention cutting is necessary. If, however, more is desirable, I secure it by putting a flat pointed fissure bur at right angles to the floor, and then cutting sideways a little distance into the walls. Two or three of these semi-circular depressions give strong retention. I use a coarse foundation body for the first bake, and rely much on the attachment of the cement to the inlay.

¹ Read before the Section on Crown and Bridge and Inlay Work, First District, Dental Society, State of New York, Nov. 6, 1912.

For impressions I use gutta percha. Caulk's Diamond is the best on the market for this purpose, but as it gets too hard and brittle with age, I have pellets made fresh every month, by kneading about three parts of oxide of zinc into one part of base plate. They are made by hand, rolling with a flat-faced copper instrument. When needed for use they are again rolled by this heated instrument until very plastic, when with moderate pressure they take very sharp impressions, and are yet solid enough to go to the bottom of depressions, without the annoying crawling of impression material. With gutta percha it is easy to get impressions even under the gum, and in any part of the mouth, a wisdom tooth being about as easy as a central incisor.

The vexed and much discussed color question has in my case been solved by exact fusing. We are all familiar with the lifelike appearance of Ash's teeth, and with an inlay exactly fused, the same translucent appearance is obtained. Few things in dentistry call for greater care than porcelain fusing.

After many experiments I have produced a shade used for all cervical inlays, a yellow with a little pink, which gives a light flesh color. It does not match tooth or gum, and yet blends with them, and reduces the long tooth appearance often noticed where the gum has receded and an inlay is inserted. In the receded gum cases, just spoken of, I often make near the gum quite a hollowed surface of the finished inlay, the gum soon grows down into this, and covers more of the filling than it otherwise would.

The principal purpose of my paper this evening is to show a model to replace those of cement or amalgam, both of which have their defects. It is a thin plating of copper, absolutely exact and strong, and very satisfactory to work on. To make it, I take the impression, as I have before stated, in gutta percha and embed it in a small cube of Detroit impression material, make our connections with wire, black lead it, and deposit the copper on it by hanging from the rods in the plating solution.

For plating we use a large Smee battery; sulphuric acid, with zinc and platinized silver elements. This battery plates slowly, but gives beautiful results; giving the required thickness in twenty-four to forty-eight hours. If a dynamo is used

three to four hours would be sufficient, although the quality of the metal would be inferior. After the copper disk is finished we complete by filling a steel cup, which goes with the swaging apparatus, with fusible metal, and float this copper plating on top.

We use this not only for porcelain inlays, but also for gold inlays and Jacket crowns with success. I recognize that this method has a limited field, and could only be used where one has a competent laboratory assistant, yet I think it is a new process, and it is so simple, easy and accurate, that if it were given publicity others might find new uses for it in our profession.

In conclusion I might add that for three years I have made Jacket crowns by the impression method, and consider the results the most satisfactory of any dental operations I have ever done. They have never obtained the recognition due them, and I venture to predict their extensive use when their beauty and value are known. I always considered them weak until I tried them. Before being cemented on the tooth base, they are, of course, weak, but after completion they are as strong as any crown, as has been repeatedly demonstrated in clinics. In all cases it is easy and wise to give the patient a duplicate, which, if occasion arises, can be put on in a few minutes. I put them on live teeth in favorable cases. One of their greatest advantages is the way the gum grows into the interproximate spaces, perfectly colored and healthy, exactly as in a child's mouth.

If the same time should be spent learning to work porcelain that is given to the roundabout methods of adapting ready-made crowns to roots, the whole standard of dental skill and results would be raised. It is surely coming, whether by the specialist or by the general practitioner, I cannot tell, but it certainly will be a most interesting and valuable specialty.

**THE PREVENTION AND CONTROL OF DENTAL CARIES.
ITS RELATION TO THE ECONOMIC, POLITICAL
AND PROFESSIONAL CONSIDERATION OF
THE DENTAL NURSE¹**

[A CHALLENGE TO THE OPPONENTS TO SHOW THAT THE DENTAL NURSE IS NOT NEEDED PROFESSIONALLY.]

BY DR. WM. P. COOKE, BOSTON, MASS.

There has been so much misunderstanding about the recent proposed dental nurse legislation that I am glad to present what seems to me a fair statement of what the Dental Nurse act was intended to accomplish. It evidently was not read by many who opposed it, and was not studied by men who made certain misstatements regarding it.

The chemistry of tooth decay, the part bacteria has in it, the pathological conditions it causes, the relation of extensive operations of repair, as in extension for prevention, the comparison of filling materials, these and many other aspects of the subject I shall not consider. The profession has placed most of the emphasis upon control of decay. Prevention is a comparatively modern aspect of the subject. One method of securing prevention is the central thought of this paper.

Economic Standpoint.

The prevention and control of tooth decay from the economic side, touches the private and public life of every child.

The examination of the teeth of school children has everywhere brought out the fact that a very large per cent. of them need immediate dental care. A large percentage of these children needing immediate dental care are the children of parents who are not subjects of any kind of charity. The teeth of these children should be treated in private offices. The fact that so many of these children are in need of immediate attention is a reflection upon the manner in which the dental profession conducts its practice. The rule is for children to seek dental aid

¹ Read before the Mass. Dental Society, May 2, 1912.

only when they are in trouble. Preventive dentistry is not the rule. From the economic side, dentistry is not saving the teeth of children as it should. As at present conducted—in comparison with the need of school children alone—the present method of prevention and control of dental decay is a failure. We are doing what our fathers did, relieving pain and doing repair work when it is brought to us. All of us frequently see young patients from comfortable homes having one or more cavities of such size and location that the ultimate salvation of the tooth is discounted before we begin treatment. Some change is needed in our method of preventing and controlling decay.

Some dentists have tried to meet the need, and have by regular appointments at frequent intervals examined and cleaned the teeth of their young patients. There is a general opinion that this work should be done once a month. The examination and cleaning of the teeth of 200 children once a month would take one-half the dentist's working time. If done by a licensed dentist the cost must be a burden to the patients. It is not a good economical plan to use either money or skill where it is not necessary.

In regard to the question of the public or charity clinic, examinations at yearly intervals do not amount to much. The examination of teeth by a physician is not satisfactory. If an examination is to be of any service it must be frequent and it must be done by one with some dental training. If these examinations are done by a dentist only, it means a large expense to the city or town. If, as stated, it is poor economy for a patient in private practice to have the cleaning done by a dentist, it is certainly poor economy for the city and town to have it done by a dentist. The town reports are calling for dental treatment for school children. These towns will not pay a licensed dentist for his time; he cannot afford to give his services. The nurse, by examination and cleaning of the children's teeth, will be more of an aid to the child's life than the special teacher in music, sewing, drawing, writing, etc. From the economic standpoint, the dental nurse will save the town and city money, but, better, she will save teeth and will prevent more cavities than ten dentists could fill.

The Financial Side of the Problem.

No one need employ a dental nurse. No one man need employ a woman assistant or office girl. A person practising dentistry who does not now employ a woman to help in his office, cannot appreciate the service now rendered by office girls, nor the improved service which would be given if these girls had a regular training.

The work these nurses are to do is one that is not now being done, and cannot have any relation to the young practitioner's start in professional life.

The young graduate cannot afford to do this work. He is not fitted to do this work, if he had been, the demand for the service would have been filled by him, and there would not be the present demand for the dental nurse. The pay a nurse would receive would not be higher than that received by the best girls in offices to-day. The object is not to develop an expensive office assistant, but to improve the standard and efficiency of the office girls we now have, and add more of the best grade.

This movement is not one planned for the financial enrichment of dentists. It will make it cheaper for the patient to have preventive dentistry done. It will help the dentist indirectly, as he will keep in touch with his patients, so he can fill cavities when they are small, and so save tooth tissue and his patients will not fear visiting him. A more permanent practice will be the result. It will in this way help the dentist financially.

The excuse that dental nurses should not exist, as they would hinder the young practitioner, is not valid. Any help in the conduct of an office will help all the dentists. The dental engine made it possible for a dentist to do more work. Should he return to the old days, because if he did the young practitioner would get more work to do? Shall a business man have his correspondence done by hand, because he will employ more clerks than if a typewriter is used? The fact is, all these things are necessary for the conduct of the work of life, and financial adjustments are continually being made to meet them. It is not good reasoning to accuse the men who backed the dental nurse movement with favoring it for their personal financial gain, and

in the next moment oppose the movement because some dentists, and some dentists soon to be, may lose money, because they might have more teeth to clean and more cavities to fill if the dental nurse did not exist.

All the talks given to students telling them that if the Dental Nurse act becomes a law they will not have any work to do, and that the dental colleges will be closed in a short time, is simply talk without proof or reason. It reminds me of the man in Plymouth, at a public meeting where they were discussing the building of a railroad, who said: "You men never can build her, and if you can build her you never can start her—and if you can build her and start her, you never can stop her—and if you can build her and start her and stop her, she will never pay." He was an obstructionist.

The method employed by some in giving monthly treatments for pyorrhea alveolaris will be a good example, as in these cases the patient pays by the year, and if he misses a treatment it is his loss. A small fee (payable in advance) will insure his attendance.

The Political Aspect of the Dental Nurse.

A few years ago a dentist would not allow a brother practitioner to enter his laboratory. He would not share his secrets with him. His attitude was similar to the one taken by manufacturers. This spirit has changed, and a professional spirit takes the place of the suspicious one. We take pride in showing our devices and methods; this interchange is freely given. When we bring a professional matter before a legislative body, the same spirit must rule, or we cease to act like professional men. If we introduce into the consideration of the subject the spirit of politics, the spirit that largely controls politics to-day, the professional spirit goes out. Politics to-day are mostly insincere, and as one writer says: "You cannot have an association of insincere men." We must choose between the two—professionalism or insincerity. When the latter comes in the former goes out: when it has gone out we have little to hold us together.

A professional man, who for personal reasons, or for the sake of his private interests or his secret society, or for the sake

of his educational institution or his associates in any institutional work or charity, appears in favor of or in opposition to proposed professional legislation on account of these reasons only, is playing politics, and is an insincere man and should not have the confidence and respect of professional men. We honor the man who sincerely differs with us on a professional subject. Our professional pride is hurt when a professional subject is discussed in the political spirit.

The Training Needed for a Dental Nurse.

The educational requirements of a dental nurse are stated very well by Dr. Ottolengui in the *April Items*. He says: "The educational limitations of the dental nurse should be just high enough to make her an intelligent help in a dental office, and yet not sufficient to give her the requisite knowledge to practise dentistry in even a small way."

We do not need nor would many of us wish to pay for the services of a nurse who had spent three to four years in a training school. The establishment of a training school where dental nurses would be trained in the best methods of sterilizing, with instructions given why this is necessary, would raise the standard of cleanliness in every office using such a nurse.

Instructions about the drugs used in dentistry; a knowledge of the general anatomy of the body and special knowledge of the head; a knowledge of the structure of teeth, not minute, only general; knowledge of methods employed by the general nurse in cases of fainting, and also some instruction and clinical training in assisting in the giving of anæsthetics, all these would be beneficial. Most of the time should be spent in clinical work in examining and cleaning teeth. As Dr. Ottolengui states it, "There is absolutely no doubt whatever that the dental nurse would by experience, rapidly become expert in that very work (cleaning teeth) which the dentist does so poorly, because of his indifference to and disgust for it."

The amount of training could easily be given in an evening course that extended through the winter. The clinical work could be secured in the public clinics in the afternoon or evenings.

We have been told by one opponent who has had considerable experience in teaching in a dental school receiving women students, that women are not fitted physically, or mentally, to practise law, medicine, or dentistry. I believe the man who believes this, is not qualified to pass upon the desirability of a woman dental nurse. In the handling of children woman is superior to man. Let the women who are district nurses, school nurses, have enough knowledge of dentistry to examine and clean teeth and to put a temporary cotton dressing in a tooth cavity causing pain. Let these school nurses have proper instruction so they can give talks to school children upon the teeth and teach them how to clean their teeth. Let them examine these children upon the subject of their talks. In this way you will do much to solve the school dental problem.

What Shall the Dental Nurse Do?

This part of the dental nurse project has been very much misunderstood. It is not and has never been the idea of the committee that drafted the Dental Nurse act, that the nurse should treat pyorrhœa alveolaris, nor excavate cavities.

The treatment of pulpless teeth was not called for. A good deal of time was spent in opposing these ideas, and, of course, the men who did it would not have taken this stand if they had known the intent of the act.

The main thought is to have trained assistants in private practice and institutional work, who will do the minor work of the office better than it is now done, and will also help in the prevention and control of decay by frequent examination and cleaning of the teeth.

The act read: "Examination and cleaning of the exposed surfaces of the teeth." In order that there need be no misunderstanding of this meaning, I would add: "This shall not include the treatment of pyorrhea alveolaris, nor the preparation of cavities for filling."

In order to be sure that a nurse should not go about from house to house, or should not in her home examine and clean teeth, the words "in the office and under the direction of a registered dentist" were added. The wedging of teeth was put in

for two reasons: *First*. A patient cannot always come when the dentist can conveniently leave his patient and put in a wedge. It is a saving of time for the dentist, for the patient he is working for, and for the patient needing a wedge. *Second*. In the examination and cleaning of the teeth as called for by preventive dentistry, a nurse finds a place needing to be wedged so the beginnings of decay can be polished away, or a place that needs a wedge to make a better examination possible. She should be trained to do this well. The wedging of teeth is a simple process.

The clause, "inserting and changing dressings in teeth for the relief of pain," was put in principally for use by the district and school nurse. It is not as necessary in private practice, but would do no harm, as your nurse would be trained alike for private and public work. Its intent is for those cases where the child has a toothache. The nurse could syringe out the food and put in a dressing of oil of cloves, or other palliative preparation, and cover the same with cotton and sandarac varnish. This does not include the preparation of pulpless teeth. I would add the words, "This shall not include the treatment of pulpless teeth." The final clause, "And assist a registered dentist during the performance of his dental operations," simply makes it legal for a dentist to have his attendant or nurse render him needed assistance. This seems a little matter, but by the wording of the dental law this is necessary.

The nurse will do other things of help to the conduct of an office, not needed to be mentioned in the dental nurse bill. She will attend to the sterilization of instruments, etc. The dental law in Connecticut, allows "the assistant of a registered or licensed dentist to perform the so-called operation of cleaning teeth." A prominent dentist in Connecticut, "one who is carrying out the prophylactic system in a way that is apparently bringing much greater success in the prevention of decay than most of us accomplish," says: "When these men realize what a glorious work women assistants can do in confining their efforts to the surface treatment of teeth they will be content to have the law amended along these lines."

By the New Hampshire dental law, a dental nurse as a stu-

dent can do any dental operation under direction of a qualified dentist. Dental nurses in New Hampshire do the ordinary cleaning of teeth, treat superficial decay in deciduous teeth with silver nitrate, apply dressings to aching teeth, and do a great deal of laboratory work and assisting the dentist generally. Compare the work women now do in dental offices with the operation of examining, cleaning teeth, and wedging teeth. Women now make orthodontia appliances, gold and porcelain crowns, gold and porcelain inlays; do all the work in making artificial rubber plates; strike up gold plates, make clasps; solder crowns, bridges, and gold plates; grind up teeth for gold plates; cast gold plates, and many other things that require manipulative skill. Does any one here believe that the examination and cleaning of the exposed surface of the teeth, the insertion of wedges, the putting of a piece of cotton in a cavity of decay to relieve pain, is to be compared with the skill needed to do any one of the mechanical operations I have just named? One legislator arose on the floor of the House, and informed that body that "The wedging of teeth was the most difficult operation in dentistry." Who believes it?

The Professional Need.

When we approach the professional side of the prevention and control of dental decay, we find ourselves in a position where our professional reputation is at stake. The dental profession has occupied a minor place among the forces that render aid to the sick. The discoveries of the past few years have placed such importance upon the condition of the mouth as a cause of disease, that dentistry has been pushed to the front, and the public are demanding of us as never before, some solution of the problem of dental decay.

Much of the work thus far rendered in school and public clinics has been very enthusiastic and quite lacking in scientific planning. Great need has been shown, but no workable scheme has been put in operation long enough to show any general improvement in the condition of school children's mouths.

I have written some of the dentists who have used prophylactic treatment, asking them:

First. How they prevented decay in

- a. Approximate surfaces.
- b. Fissure cavities.

They used the polishing strip and the polishing of the approximate surfaces with pumice. The treatment with nitrate of silver in small fissures; the polishing of the other surfaces by use of wood porte polisher and pumice with peroxide of hydrogen. These treatments were used monthly by several men when the patients were from 6 to 16 years of age. The consensus of opinion was that the patients should be seen often. The same method of treatment was used by all these men.

I would, therefore, with this professional support, say that if we are to prevent decay of the teeth of children, we must see them at frequent intervals. Our primal object must be to prevent, not to repair. To the question, "How soon after the eruption of a tooth should fissure cavities be filled," it is the consensus of opinion that they should be filled immediately.

We need a new vision of the possibilities of dentistry. The loss of any tooth except the third molar is, in most cases, a serious matter for a child. Because we do not know how to prevent all decay, we should not be content with our present repair methods. Much of the repair work now done would be unnecessary, if we used prophylactic treatment, and secured the patient's help in the arrest of decay. A patient may keep his teeth clean to the casual observer, and still have culture medium, the remains of food, covering large portions of the teeth. Such cases need prophylactic treatment. The kind of food has much to do with decay; the candy habit; the question of inheritance. We cannot control all of these conditions. We do, however, know that the cleaner the teeth are kept, the less likely they are to decay. Knowing this fact, the usual custom of cleaning teeth only when the patient comes for other work will not prevent decay.

The custom followed by many patients, of consulting a den-

tist only when they have pain, or at such long intervals that they have large cavities, is not prevention or even control of decay. If we are to make the best repair work, the repair must be done with the least loss of tooth tissue. Take the fissure cavities, the original defects. These, if cut down and filled before they begin to decay, will not become large cavities. We can promise success in this class; our control of this kind of decay is very good. If we allow these to go, until as is usual, a good deal of tooth tissue has been lost, we are not keeping good control of decay.

On proximate or other surface decay, proper care by patients and prophylactic treatment at frequent intervals is all that we can do. The point is, how shall we secure the attendance of the patient, and how shall we furnish prophylactic treatment? How shall we keep in touch with the patient so we can fill the fissure defects when they are small? In Connecticut, "an assistant of a registered or licensed dentist can perform the so-called operation of cleaning teeth." Women are used for this purpose. They can render a similar service in New Hampshire.

Trained Woman Nurse; Value in Conduct of Office.

The present method of using women assistants is for each dentist to train his own. It is similar to the preceptor methods, now obsolete, used in medicine, law, and dentistry. This does not give a uniform service. One woman is better than another; some men can train a woman assistant better than other men. The same office will not have the best available service from women assistants at all times, as in the changes that take place, in teaching new women, the service cannot be continuous. In the use of trained women nurses, you can have a continuous standard of service. We, as dentists, know that, as a whole, the method of sterilization and cleanliness in dental offices is very poor. We do not know how much this has to do with the spread of disease. Can any dentist doubt that the replacing of the present methods of sterilization and care of instruments by methods taught to the dental nurse would raise the standard of dentistry? At the hearing upon the dental nurse bill, one Massachusetts dental educator spent some time talking about the danger of infection from dental operations—this being one of the most

dangerous regions in which to operate. He said that the use of a dental nurse would increase this danger. Now, imagine for a moment a trained dental nurse who has graduated from a school for dental nurses. This woman enters an office where the usual methods of sterilization are used, and this service is now rendered, if rendered at all, by cheap girl labor. A woman at 18 is as mature as a man of 21. This trained nurse takes charge of the office that has had untrained service, or, as is generally the case, no service. The methods are changed at once, the patients have the best. This nurse examines and cleans the children's teeth; she is an assistant, as the surgical nurse is an assistant. Does any one doubt that the patients receiving treatment in that office will have a cleaner, safer treatment at the hands of the dentist? Can you believe that the operations done by the nurse will be less safe than by her employer, or that she would employ one method of sterilization for the dentist and none for herself? Would the dentist allow this?

This talk on infection given at the hearing as an argument against the dental nurse is one of the strongest for it. The speaker condemned a large part of the dental profession, and justly, but he did not know it. As an argument against the dental nurse it amounted to nothing, but as a proof that she is needed, it is of great value.

The cry that the dentists wish the dental nurse so they can render less service and make more money is a slander. The nurse will make dentistry cheaper for the patients; minor operations will be cheaper. The patients will need less work, as they will have less decay, but are we to deplore the reduction of decay? Does a physician lament because, with the care given by a nurse, his patient gets well in six weeks instead of twelve weeks without a nurse, and he receives half as large a fee? This is the point to which this argument leads.

The practice of a dentist will, however, be upon a better basis with a nurse, as the results secured will be so much better. The patients will have more assurance of keeping their teeth and without their being a financial burden.

The prevention of large cavities by the filling of cavities when they are small will make the work of repair done by the

dentist of more permanent value. The parent will see the value of this method and will support it. The use of a dental nurse in the public clinic, touches a different phase of dental conservation.

I believe we have only scratched the surface of this problem. We have found the need. In the application of the remedy we have been beating the air; we have listened to a lot of bragging and boasting.

The quoting of so many operations as an indication that the dental clinic is handling this problem of dental decay and diseased mouths, is misleading. If a child's mouth is not put in a healthy condition, all diseased teeth removed and all cavities filled, what good does it do to fill one or two cavities and let her go? She is just as much a source of infection as before.

The *individual* mouth in a healthy condition is the *unit* of measurement in determining how much we are doing in reducing dental caries and diseased conditions in school children's mouths.

The men who have given time and effort to the public clinics claim that the service of a woman nurse who has been trained to do minor work, principally examining and cleaning, would help greatly in handling these clinics. Now, the need of assistance is in private and institutional work. We have testimony from both sources, as proof that without the help of the woman nurse the prophylactic treatment cannot be done. The nurse is not only needed for this work, but is needed as a trained helper in office and public clinics, trained to do the things she is wanted for. Means are at hand to educate these women when it shall be legal to use their services. Shall we come in at the tail of the procession of progress? In efficiency we are behind New Hampshire and Connecticut. Some men who see this need offer the trained woman assistant or nurse as a help in solving this problem. What other aid can we have? Surely, the trained nurse would be better than one with no training, or an indifferent training. The business man has his trained typewriter, the physician his trained registered nurse. We do not now need a nurse with the same length of training that the medical nurse receives. We do need a service that is better than we now have, because it will

be trained and of a certain definite standard. If it is true that we can prevent and control decay better than we do at present by having the dental nurse, it becomes a professional duty for every man with professional pride to work for this object. It means a raising of the standard, an increase in efficiency, and will place dentistry upon a different plane from the one we now occupy.

The recently proposed Dental Nurse act could be improved in some of the minor details. The indorsement of the nurse's application by the registered dentist by whom she is to be employed, can be omitted.

The payment of a yearly fee by the nurse can be omitted.

The educational requirements can be stated, though in this respect the act followed the lines of our dental law and left that to the Examining Board. It might be better to call for a Special Board, similar to the Board of Registration of Nurses, and relieve the present board of any extra labor. The nurse can be required to graduate from a training school before being examined. The main issue is as stated by a prominent dentist in Connecticut: "An assistant for the surface treatment of the teeth." He also says: "The prophylactic assistant has got to come, and if the dental profession is not a trades union, it will not withhold this important service from the public any longer."

The *Dental Brief*, for May, has an excellent editorial upon "Registered Dental Nurses." The closing sentences are: "It can hardly be doubted that the defeat of the dental nurses' bill is but temporary, and that ultimately, dental nurses will be authorized by law, not only in Massachusetts, but in every State in the Union."

The examination, wedging and cleansing of teeth; the application of a temporary dressing for the relief of pain in a tooth; the assisting of the dentist in the performance of his dental operations, these things to be done by some one trained to do them—they do not look very objectionable when you see that pyorrhea alveolaris is not included.

The treatment of pulpless teeth is not included.

No filling is included.

An expensive nurse is not needed. Simply a woman with a

portion of the mechanical skill now shown by many women making crowns, inlays, etc., for a small salary.

Surface cleaning of the teeth—the prophylactic assistant is a needed help in the prevention and control of dental caries for private practice and institutional work. Is there any other solution of the problem?

Our State Society, by representation from each dentist, should have its part in solving this problem, by securing proper legislation, making the employment of the dental nurse legal.

A PLEA FOR THE CONSERVATION OF THE DENTAL PULP IN ALL CLASSES OF OPERATIONS¹

BY DR. GEORGE EVANS, NEW YORK CITY.

One of the subjects on which variance of opinion exists among members of our profession is the actual value of pulps of teeth when extensive decay, inlay, crown or bridge-work operations suggest their removal. The extirpation of the dental pulp is a matter not seriously considered by many, while others place great value on preservation of this organ. It is therefore, I think I can safely state, one of the subjects in dental operations open to discussion. It is not my intention to wander into an extensive scientific discussion of matter relative to the pulp, which is generally understood and accepted. I will only mention such facts as may be necessary to support points in my discussion.

To those who place little value on the presence of the dental pulp when the patient is over 25 years of age, on the theory that the pulp as a formative member by that time has performed its functions and its presence is no longer required, I will say: The pulp vitalizes the dentin during its formation, and afterward continues to perform that function as long as the tooth is retained in a normal condition in the mouth. The pulp lessens in size as years advance, but it is not obliterated; it still maintains vitality and integrity of the dentin and enamel. As one of the many instances I have in mind, I will mention the case of a patient 87 years of age, for whom recently I had to use the same treatment to remove the pulp from a bicuspid tooth that I would have used for a younger or middle-aged person. This is a condition that has been observed by experienced practitioners and establishes beyond question the fact that Nature intended the pulp, after tooth formation, to perform a second function. The pulp then, assumes a fixed anatomical character, as the source of the vascular and nervous supply from which the dentin derives and maintains its vitality. In pulpless teeth, the dentin and

¹ Read before the First District Dental Society, New York City, November 4, 1912. See discussion, p. 482.

enamel degenerate in structure, in time soften and, as a result, the attachment of the enamel to the dentin is weakened. In resistance to force of occlusion pulpless teeth are impaired in contrast to teeth with living pulps. Pulpless teeth are liable to pathological conditions from which teeth with pulps are exempt. Such conditions, though, are largely attributable to lack of skill in root canal treatment. Nevertheless, though under the best treatment, unfavorable conditions will occasionally supervene in pulpless teeth from which those with living pulps are exempt. The difficulties encountered in root canal treatment we should consider. The roots of some teeth present obstacles to effective and reliable treatment. I refer to cases where the roots are of unusual length and form, and the pulp canals of a character that render their proper enlargement for treatment difficult or impossible, even though radiographs are used which outline the forms of the roots.

Partial calcification of the dental pulp does not at all times, in my opinion, suggest its removal. Vitality of a portion of a pulp will maintain the integrity of the dentin and enamel sufficiently to prevent their degeneration in structure. As long as the vitality is maintained in such teeth, troubles resulting from the presence of septic gases are avoided. The argument will be advanced that in such cases of partial calcification the pulp is liable to die, and in bridge-work operations cause serious trouble. This is of seldom occurrence when acute pulpitis has not preceded. Chronic cases always suggest pulp removal.

In filling operations we may take chances that are not advisable in crowning or extensive inlay operations, and especially in the use of teeth as abutments for bridge-work. In cases of extensive decay, verging on exposure of the pulp, the dentin, and especially the portion over the pulp if it is decayed or semi-decayed, should be sterilized. This is best performed by placing and sealing sterilizing agents in the cavity to remain at least two or more days. I consider non-coagulants of albumen are the most suitable for the purpose, as they are diffused more readily through infected and decomposed or semi-decomposed dentin. Ordinarily I use a saturated solution of aristol in oil of cloves, eucalyptus, or cassia. I prefer the clove solution when a sedative effect is desirable. When I desire to leave sterilizing agents in

position for a considerable length of time, as in cases of pulpitis or where decay closely verges on exposure of the pulp, I place in the cavity a pellet of a paste made of chalk, carbolic acid, oil of cloves and aristol, sealed in with a gutta-percha temporary filling.

In such cases where I leave a portion of decay over the pulp to avoid its actual exposure in excavation, I spread a thin layer of the paste over this decay to remain permanently and cover and partly fill the cavity with oxyphosphate cement. Fig. 1, D, shows the supposed line of decay, M the chalk mixture, and C the cement. If a pellet of this chalk mixture is placed in position and sealed with gutta-percha in such a cavity, and after the elapse of a week or two the rubber dam is applied and the gutta-percha heated and removed, the mixture will be found in a dry powder, much lighter in color, showing that absorption and volatilization of a portion of the agents have taken place. When permanently placed in such a position, this chalk mixture likewise acts as a medium in the character of an earthy chemical deposit to absorb and neutralize any remaining trace of sepsis for a long period. This paste is specially useful for normalization of hypersensitive dentin. For such a purpose seal a pellet of the paste in the cavity for a few days. It is not injurious to a gum margin if kept in contact with it.

In extensive caries, the dentin over the pulp is infected with bacteria and saturated with septic gases. A superficial application of an agent such as carbolic acid at the time of operating in such cases will not entirely destroy the bacteria, nor neutralize or eliminate septic fluids and gases that are present in that portion of infected and decayed dentin left remaining. The infection is not superficial, but extends through its entire area, and sterilizing agents require time for thorough diffusion. Aristol in this process aids materially, as the iodine it contains is eliminated in a nascent form, which entering into chemical combination with the sulphurous and other gases present, sets the hydrogen free. Unless such a sterilized condition is secured, the septic matter and its gases are hermetically sealed in the cavity. In many such cases pulpitis and resultant conditions follow.

If the cavity has been filled with oxyphosphate and no in-

tervening substance applied, the trouble is often attributed to the oxyphosphate, and its use condemned as a devitalizer of pulps. In this discussion of pulp preservation, my contention is, that when removal of decayed dentin directly over a pulp will cause its exposure, the dentin should be allowed to remain and be sterilized, *on condition*, that the sterilized area can be hermetically sealed in the cavity with an intervening area of dentin free of decay remaining between it and the margin of the cavity.

By proper sterilization in caries, as outlined, pulps are generally preserved which otherwise would be lost. In operative dentistry, preservation of pulps in the front teeth, especially in young persons, to avoid gradual discoloration of the crown, is a matter recognized by all operators as of great importance.

In crown and bridge operations, pulps of teeth are at times destroyed that might be preserved by a different method of construction. I will give a few illustrations:

In cases of abrasion the pulp usually can be preserved by constructing the cap as in Fig. 2. If necessary a short pin can be placed toward the palatal side. Through the great adhesive properties of cements of the improved forms as manufactured at the present time attachments may be obtained without a pin in caps of moderate depth, in cases where it could not have been done a few years ago with the cements then made. With badly decayed bicuspid in which considerable calcification of the pulp is present, when fracture of the coronal section occurs, a gold cap with a porcelain front can be used, and the operation frequently performed without destruction of the pulp.

In the capping of molars the assertion frequently is made that caps cannot be properly fitted at the cervical section without pulp devitalization, and that devitalization of the pulp is justified so as to permit proper adjustment of the collar. This statement is true in instances where the molars are long, with a small neck and large occluding surface. In such cases pulp devitalization can frequently be avoided when a support for bridge-work is required by resorting to other means than that of capping. Of these methods I will mention the bar-anchorage or the partial cap, the inlay, or inlay combined with a partial cap. An inlay for use as an anchorage should have two or three pins.

FIG.1

C - - -
M - - -
D - - -

FIG.2

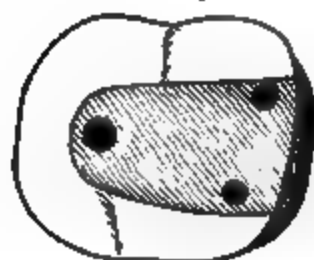
FIG.3



FIG.4



H



P

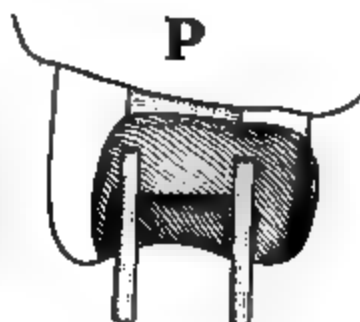


FIG.5



FIG.9

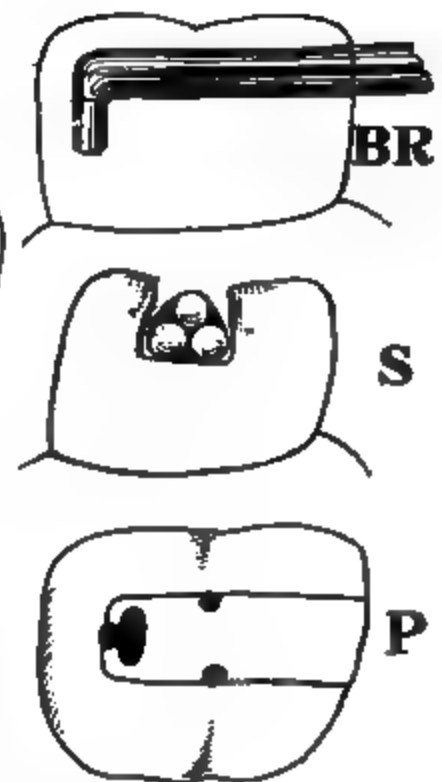


FIG.6

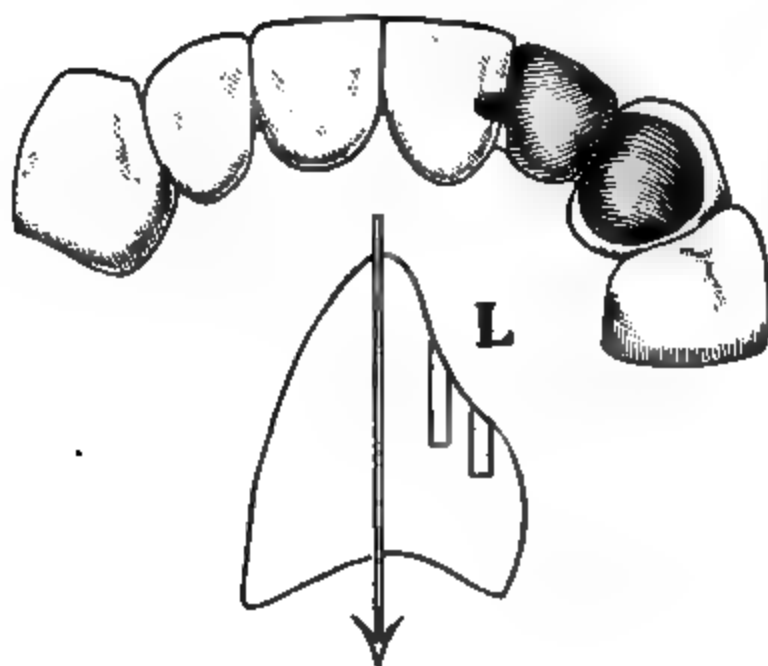


FIG.7



FIG.8



To demonstrate the use of an inlay combined with a partial cap, I will illustrate a practical case recently treated (Fig. 3): A lady lost the first and second superior bicuspids right side. She wished to remedy this vacancy, which materially disfigured an otherwise good appearing set of teeth. The occluding teeth on the lower jaw, owing to the absence for many years of the upper antagonizing ones, had elongated, and gave but little room for an occluding surface for the artificial substitutes. Under the conditions present, and the fact that the patient only desired to improve the appearance, and declined to allow me to cut into the cuspid for support, I constructed an extension-bridge, supported by an inlay, which contained three pins and partly capped the mesial side of the molar. The mesial pins were 20-gauge. The distal pin, 17-gauge, was inserted as deeply into the posterior section of the dentin as I could place it, without endangering the pulp, to obtain a secure attachment and resist the leverage exerted by the bridge. A spur rested on the cuspid. Fig. 4 shows the construction, H the position of the holes for the pins and cavity to receive the inlay, also line of the partial cap. P illustrates line of the two mesial pins and also the partial cap.

The artificial restoration of a front tooth without pulp removal or considerable mutilation of the abutment tooth perplexed me for some time in a case such as is illustrated in Fig. 5. The Litch pin-anchorage which I first used was found to be a failure, as the attachment loosened. A few years ago I devised the following method, which has proved reliable in cases where I considered it suitable: I removed enough of the surface of the tooth to allow a plate of metal to intervene between the occluding teeth. The removal of a little of the incisal edge of the lower tooth will often assist this. I next drill three (3) holes, 20 to 21 gauge, on the palatal side, two of which are placed toward the proximate sides and the other in the cervical section, as shown in Fig. 6, in the cuspid. These holes are drilled in a direct line with the axis of the root of the tooth (see L, Fig. 6). The holes at the proximate sides are to occupy that portion of the tooth structure which is included generally in cases of proximate decay that do not expose the pulp. If a gold fill-

ing or inlay at the time occupies that portion, drill into it as you would into the tooth structure. If the filling or inlay is a substantial one it will not be disturbed.

In brief, the construction is as follows: Swage and adapt to the palatal surface, extended on the proximate side to where the artificial tooth is to be adjusted, a piece of thin platinum, about 38 United States gauge. This little disk of metal is fitted to the surface of the tooth, perforated over the holes and the pins inserted, next attached to the plate with wax, the whole removed, invested, and soldered. The disk is next refitted, reinforced with gold and the artificial tooth attached with a spur resting on the central incisor, as shown in Fig. 6.

As a support for teeth loosened by pyorrhea, this pin cap attachment can be used, without devitalizing the pulp. In narrow lower front teeth the limited space will generally only admit of pins being inserted on the proximal sides of an incisor. When the space is so small as to not even admit of this, a resort is only to be had in pulp extraction.

As a practitioner of 30 years' experience in treatment of pyorrhea, I see no benefit to be derived in removal of pulps in affected teeth, unless the roots become sensitive to such an extent as to demand it. By the maintenance of vitality of the pulp, that of the connective tissue is also more reliably maintained. The theory advanced that on removal of the pulp the circulation is diverted to the membrane of the pericementum, is of no special advantage, and even if such were the case it can only be temporary, as the blood supply in a short time will regulate itself to the changed condition.

We frequently have in practice, cases where the patient would be benefited by the insertion of a lost superior or inferior bicuspid and molar, such as is exhibited in Fig. 7, and the circumstances of the case will permit of only the simplest and least laborious operation. By this I mean will not permit of suitable trimming of the natural crowns for properly fitting a gold cap to the cervical section. This may be owing to hypersensitiveness of the dentin, tipping forward of the molar, the expense of the operation, or objections on the part of the patient to have the natural teeth extensively trimmed.

In such a case, the object is to secure anchorage for the abutments in the simplest, but nevertheless *an effective* form. There are means by which this can be comparatively easily accomplished with little or no removal of contour or mutilation of the crowns. The Short Cap Method—this method I have used for many years to support a bridge in cases where conditions such as I have just described suggested it. Fig. 7 represents a typical case. The coronal section of the natural tooth is trimmed so the sides of the occluding third, and a portion of the middle third, are paralleled. A proper amount of the occluding surface is also removed. From impressions of the bicuspid and molar, close fitting seamless gold caps are struck up and fitted to extend as shown in Fig. 8, which is not beyond the trimmed paralleled section of the natural crown. The edges of the caps are beveled, closely burnished, and having been cemented, the edges are again gone over with stone polishing points and revolving burnishers in the engine and rendered imperceptible to the tongue. Fig. 8 shows the case completed. In cases of pyorrhea, this form of construction is preferable to using caps that extend under the gum margin.

In the support of a bridge by a molar, when conditions favor it, I often use a bar in preference to an inlay. A bar may seem an old method in this day of inlay enthusiasm, but it has to me some merits not possessed by inlays. The bar requires less removal of the occluding surface to properly insert it, and the bar can be easily removed without its mutilation. For stability I have found it equal to the requirements when made and inserted as I here illustrate and describe. I remove enough tooth structure to place the bar, as shown in B. R., Fig. 9. A tooth in sections shows the proximal side. The wire forming the bar is given the shape there illustrated and about the width of the orifice of the cavity. I cement the bar in the slot with amalgam, and fasten it in position with a few pellets of gold foil, inserted in two or three pits drilled on each side of the bar into the tooth structure (see P, Fig. 9), to firmly retain the bar while the amalgam is setting. I make the bar of heavy iridio-platinum wire, or form it of three wires, No. 20-gauge placed in triangular form, as shown in S, Fig. 9, the wires being soldered together

with pure gold. The triangular shape of the bar when fastened in the devitalized cavity, with the right-angle curve to its end, inserted into the posterior slot or hole (P), gives the bar an anchorage that can be relied upon.

In describing this bar attachment and other methods of construction, I do not wish it to be conceived that I do not value inlay and casting methods; I believe they have a place in our operations, but not to the entire exclusion of other forms. I believe before long many who resort to the casting process, as they do at present in most every operation, will become more impartial respecting former methods.

I will conclude by describing a removable attachment for bridge-work shown in Fig. 10 for use in preference to methods that require removal of the pulp. In construction, it consists of a split pin that fits into a flange attached to the side of a gold crown. The flange has three flat sides. The palatal and buccal sides expand toward the gum so as to make the flange a little wider at that point than at the occluding surface. The buccal and lingual sides of the flange are clasped by two flat pieces of clasp gold with bent ends attached to the post. These side springs slip over the narrow upper edge of the flange, and slide down the slightly diverging sides, and then slip to position over the slightly rounded edges at the end of the flange which clamps the attachment in position, while the split-pin steadies it until enough upward force is applied to bring the bent ends of the springs up on the sides of the flange. In conclusion I will state that the described methods are only a few of the many which may be practised to avoid pulp removal and excessive mutilation of tooth structure.

MASSACHUSETTS DENTAL SOCIETY**REPORT OF COMMITTEE ON DENTAL NURSE.¹**

At the last annual meeting a motion was passed calling for "a committee to confer with the Massachusetts State Board of Registration in Dentistry, and to draft a bill to be submitted to the Legislature, making the dental nurse a legal help in private practice and in institutional work." A letter dated September 25 notified the writer of his appointment as chairman of this committee. The persons comprising this committee were later changed owing to a clerical error in the first list. A few days' delay was caused by this change.

Your committee conferred and talked with members of the profession in order to secure information regarding the essential points in the nurse problem. As a result, and with the help of good legal aid freely given, we put these ideas in legal form. We followed many of the wordings of the Act for Registration of Nurses. This preliminary draft was given to the president of the State Board the last of October. This copy was not as perfect as we wished; in fact, it was not read after being typewritten. The president of the State Board helped us by having copies made and giving them to the other members of the Board.

The Board hoped to meet your committee in a few days, but the examinations took all their time, and they could not arrange to meet us until the last of November. We spent a pleasant evening with them, but were unable to come to any agreement for united action. It was doubted by the Board if there was any sentiment in the profession, or in the public, calling for a dental nurse. We said we would try the profession and see whether such sentiment existed, and if they would support such legislation. The matter was brought before the various societies, and committees were appointed on the dental nurse, with power to help any movement made to secure needed legislation. The following societies took part in the movement:

¹ Read before the Massachusetts Dental Society, May 2, 1912.

The American Academy of Dental Science.

The Harvard Odontological Society.

The Harvard Dental Alumni Association.

The Tufts Dental Alumni Association.

The Dental Improvement Society.

The Massachusetts Dental Hygiene Council.

The Metropolitan District Dental Society.

The Massachusetts State Society was represented by your committee. The committees appointed made a Joint Committee, who went over the preliminary draft of the bill and made some needed changes. This bill, while not so perfect as we wished, and probably lacking in some explanations that would have made its meaning clearer, was presented to the Committee on Public Health on March 6. Arguments in favor of the bill were made by Doctors E. H. Smith, H. W. Hardy, H. H. Piper, C. E. Parkhurst, and Wm. P. Cooke. Mr. Joshua Dill, Mr. Sterling, and Miss Melita Knowles represented the Woman's Educational and Industrial Union. Mrs. E. A. Codman represented the Instructive District Nursing Association. Dr. Quinn, of Pittsfield; Dr. Flynn, of Boston; many other members of the dental profession and persons representing other organizations were present, and would have spoken but time enough was not allowed for the full and free presentation of the subject. Considering all the circumstances, we think the matter was well presented. The afternoon was given to the opposition. Three members of the State Board spoke in opposition, Doctors Dowsley, Barrett, and Maxfield; Dean Williams, of Tufts Dental School; Dr. Flanagan, Dr. Hunter, Dr. Sullivan, and Dr. Abbie C. Sullivan, of the Woman's Dental Club. No fundamental feature of the bill was discussed by the opposition. Most of the time was spent upon two things that were not wanted and were not thought of, and were not called for by the bill.

First. The treatment of pyorrhea alveolaris and the preparation of cavities for filling.

Second. The treatment of pulpless teeth.

The bill was given leave to withdraw 6—5 by the committee. On April 3 it came before the Legislature, and was refused to be substituted 92—124.

No piece of legislation could secure more misrepresentation than did this proposed act for dental nurses. It was misrepresented before the committee, and the method of conducting hearings allowed no reply. It was misrepresented on the floor of the House, and by the last speaker who would not allow any interruption for a reply. Your committee and other practitioners who have up to the dental nurse movement enjoyed the reputation of professional honesty, have been publicly accused of favoring the legalizing of the dental nurse for their own financial gain. The charge was made at the hearing and on the floor of the House. We feel in the face of this charge like the preacher who had all his life been a foe of the liquor traffic, and was offered money by a liquor dealer for his influence in favor of his business. He said, "Well, my friend, if I have lived so carelessly all my life that you think I would do this thing, I ought to rise for the prayers of the congregation."

If the members of the dental profession believe these charges they have made, and have allowed to be used in opposition to the nurse bill, they should prefer charges of unprofessional conduct before every dental society of which the movers in this movement are members, and the backers of this movement should, if these charges are true, be expelled from the association with professional men. Your committee and the Joint Committee have purposely avoided personalities, and have discussed this matter professionally. We did not invoke the aid of the primary department in dentistry, neither did we rob the dental cradle to help our cause. We did ask men and women who have labored for the public good to speak for this improvement, and they did so. We presented the matter in a dignified and manly manner. We are content to lose rather than to win by other means. Your committee believe the principle of the dental nurse is right, and the right must win in the end.

WM. P. COOKE,	} <i>Committee on</i>
ALFRED P. ROGERS,	
HENRY H. PIPER,	
	<i>Dental Nurse.</i>

REPORTS OF SOCIETY MEETINGS

FIRST DISTRICT DENTAL SOCIETY OF THE STATE OF NEW YORK

October 7, 1912. .

A regular meeting of the First District Dental Society of the State of New York was held on Monday evening, October 7, 1912, at the Academy of Medicine, No. 17 West Forty-third Street, New York City.

Dr. William J. Gies made an address, entitled "Some Recent Developments in the Study of Dental Caries."¹

Dr. Alfred P. Lothrop read a paper on "A Study of Salivary Mucin."²

Discussion of the Papers of Dr. Gies and Dr. Lothrop.

Dr. J. Morgan Howe—I will only take time to emphasize the point that Professor Gies has called our attention to the use of acids for the purpose of cleaning the teeth, and in that way preventing decay. I began to prescribe the use of acids to some of my patients directly after Dr. Gies made the recommendation of this use of acid, nearly three years ago. It was in those cases where there was great susceptibility to decay, and where there was great difficulty in the patients keeping their teeth clean. We all recognize what a great difference there is in the mouths of different people in the ability to keep the teeth clean. Some who are very neglectful have pretty clean mouths, and others who are very solicitous and make great efforts to keep their mouths clean with brushes and dentifrices are very unsuccessful; and it was in these latter cases that I recommended a weak solution of vinegar to wet the tooth brush with, and scour the teeth first, and then use anything they chose afterward. The results obtained in every case where the patients followed that suggestion are very satisfactory. I have never known any of the patients to keep

¹ See p. 397.

² See p. 410.

their teeth so clean as they did when they used the weak acid solution in that way. That is the one point I wish to make, but I would like to make it sufficiently emphatic to have the suggestion acted upon, and for you to make a thorough test of it, and report on the subject, because there seems to be a probability that it presages a radical change in our treatment of the mouths of our patients, and the recommendations we will make to them. It is certain that our use of alkalies has not been attended with success.

I want to say a word in regard to the auspices under which we have been able to conduct these researches for the last three years. We are now at the close of three years' work and the beginning of the fourth year under Professor Gies' direction, in the laboratory of Columbia University, and you probably remember that Professor Gies has very generously supervised and directed these experiments without any remuneration in the effort to discover possible causes of dental caries.

Professor Gies is one of the busiest men in New York, but notwithstanding that, he has been willing to do this on account of his scientific interest and his recognition of the great need there is of discovering causes and preventive measures for dental caries. The assistance required in carrying out his directions in the laboratory is all that it costs us. We pay for the assistants' work, under his direction.

The fund which we have now been using for three years at the rate of about \$750 each year, was a fund made up by subscription of the active members of the New York Institute of Stomatology, through the especial interest of the late Dr. Benjamin Lord. He not only subscribed himself to the fund, but obtained contributions of \$100, or so, from a number of his patients. We ourselves at that time subscribed various amounts, some of us as much as \$100, and some of us less. The money was raised in that way, which we have recently been using in this work, and, of course, depleting the fund. Possibly it will be necessary for us to spend more than \$750 this coming year, and we need, at some not distant time, to have the fund replenished; and for this I would urge the interest that all should feel for humanity and for our profession. Perhaps you will be able

to talk to your patients in such a way as to lead them to make contributions to this fund, and you may be called upon to make contributions yourselves. We may have to pass around the hat to see how much you are interested in it. We cannot carry on these investigations without some money. The public will, I feel sure, eventually contribute liberally to this line of work, for the standing of all branches of science—especially medical science—is greatly advanced in public estimation by the demonstration of preventive measures.

Dr. Nodine—You said the mucin sometimes was acid, sometimes was partly neutralized, sometimes it was over-neutralized. If an acid like vinegar is given, and a flow of saliva is stimulated, which of the three conditions of the mucin will this stimulation produce?

Dr. J. Grant Pease—I have been so much impressed with the essay of the evening that I am going to try it in my practice. As I understand, the Sicilians have been using lemons a great deal, and it has been proved that their teeth have not been dissolved. Dr. Howe has used acid for his patients for several years, and he has not said anything in relation to the dissolving of the lime salts.

I can hardly believe that such a thing could be possible. I would like to ask a few questions in relation to my patients.

Mention was made of vinegar, and also of lemon. In regard to vinegar, it has been mentioned that very often it is adulterated. We know that lemons cannot be adulterated. If I advise my patients to use vinegar, I cannot be sure it is not adulterated. Why not tell them to prepare a small quantity of lemon juice to be used in water?

Another question is, How often should they use it? How long does it take for a plaque to become fixed? Should a solution of lemon juice or vinegar be used twice a day, or once a day? I should think once a day, in the evening before retiring.

Tartar—salivary calculus—as I understand it, is made up of the sticky deposits of mucin and the lime salts. I would like to know if the essayist could give us any light on the effect of the new method in retarding tartar—whether the application of the weak fruit acid would influence or inhibit the deposit of tartar.

In relation to the many proprietary articles on the market, I presume there would be no objection to telling a patient he can use a proprietary article, after using the dilute acid, to bring about a greater amount of friction. By that time the mucin deposit will have been disintegrated, and the proprietary article could be used.

Dr. Homburger—Accepting the points which Professor Gies has brought out, why is the ordinary hydrogen peroxide, which is acid, not germicidal and not very cleansing, whereas alkaline perborate of soda, in saturated solution, is both cleansing and germicidal?

I have used the perborate of soda, and have held it in the mouth for a period of three to five minutes, which is probably the only way in which a germicidal dentifrice should be used if it is to be of value.

Dr. Nodine—Calcium carbonate is a neutral substance, is it not? Will that just satisfy an acid?

A Member—Will the doctor give us a simple test by which we can detect the adulteration in vinegar?

Dr. Zentler—I wish to emphasize that no error must be made in using the general term "acids," the essayist having differentiated and specified "vegetable acids" as the only ones to be used.

On the other hand, I must point out that for the present at least, the essayist left unsolved the problem of the proportion of vegetable acid to be used, in various mouths, having failed to specify that, according to the mouth of each individual, the proportion must vary. It must not be overlooked that after all, the formation of mucin is not a purely local process, but rather a question of general nutrition—of more or less perfect metabolism—the quantity of mucin formed varying not only in the mouths of different individuals, but even in the mouth of the same individual at different times.

Therefore, I believe it to be conclusive that establishing the proportion of vegetable acid to be used, is of as much importance as the use of the acid itself, although it may, perhaps, be too much to expect at this stage, when the investigations have gone only as far as they have.

Dr. H. W. Spencer—I would like to ask Dr. Gies if he has ever experimented with a solution of chloride of sodium as a means of breaking up mucin plaques?

Several years ago I was impressed by the fact that, despite the utmost care, and using the best alkaline preparations available, even dentists could not prevent decay in their own teeth.

Alkaline preparations failing, something entirely different seemed indicated. A neutral salt solution might do it, and, if not, a vegetable acid might be tried. For some time past I have been using in my own mouth, a solution of sea salt, and so far the results have been good.

In regard to the flow of saliva—investigators seem to overlook and do not mention the significant fact that the six anterior teeth in the lower jaw seldom decay.

As these teeth are continually bathed in saliva, the conclusion must be reached, that a free flow of saliva helps to prevent decay.

Dr. Nies—Dr. Gies may not know that the use of acid washes is common among the working classes; they use a solution known as spirits of salt to clean their teeth, this is a 4 per cent. solution of hydrochloric acid. The prolonged affect of its use is to decalcify and eventually ruin their teeth.

I want to speak of the effect of grape-fruit on the teeth. My teeth felt as if the citric acid of that fruit was affecting the enamel, for I could scarcely masticate after eating a half. To ascertain what its action was, I placed a few recently-extracted teeth in a glass of grape-fruit juice. On examining them later I found a distinct surface erosion.

Dr. Gies—How did you know that the grape-fruit juice had this effect?

Dr. Nies—I saw the effect on the extracted teeth. The surfaces of the teeth were eroded, the gloss had left them, and the surfaces felt granular to the touch. These teeth had been emersed in the solution three or four days.

Dr. Gies—Did you examine the juice for calcium?

Dr. Nies—I was trying to determine by appearance whether the teeth were being injured or not.

Dr. Gies (closing)—In answer to Dr. Nodine's first question

I wish to say that acid, such as acetic acid in vinegar, converts salivary mucin into precipitated, flocculent, insoluble mucin. In this solid condition, mucin is a non-adhesive, very slightly acid mass—less acid than the acid precipitant in the vinegar. Vinegar stimulates a flow of saliva containing mucin in a neutral or alkaline condition. Calcium carbonate, replying to Dr. Nodine's second question, is a neutral product, but, like carbonates in general, decomposes in the presence of any acid or acid salt stronger than carbonic acid.

In response to Dr. Pease's remarks I would suggest, until we know better, that patients be advised to use the "food acid" carrier, whether dilute vinegar, fruit juice or any other form, daily before retiring. The frequency and best means in general of applying the "food acid" method I have been urging for three years *must be worked out by dentists in actual clinical tests*. At present I can only guess what details may be productive of the most desirable results. It is for you to determine these details from experience in extended observations and from many reports on results of careful and thorough tests. The "food acid" treatment should inhibit tartar formation by preventing depositions of mucin, phosphate and carbonate, and might be followed advantageously by the use of an ordinary tooth powder or mouth wash. At a former meeting I suggested that this sequence of treatments might be desirable—but let experience decide!

I am unable to answer Dr. Homburger's question, but would suggest that he inquire closely into the possibility of error in his conclusions. as stated.

I have not experimented with sodium chlorid solutions in this connection, although I know they do not disintegrate smeary mucin films with the thoroughness and promptness characterizing the action of fruit juices and their acids and acid salts.

Dr. Nies's reference to the use of "spirits of salt" containing hydrochloric acid leads me to say, once more, that *mineral* acid is not "food acid." Hydrochloric acid is a *strong*, highly dissociable (*reactive*) acid, whereas fruit acids are *weak*, poorly dissociable acids. The former, even in very dilute solutions, inhibits salivary flow and markedly decalcifies enamel during short periods of contact. Ferric chlorid solutions, which contain

free hydrochloric acid, are detrimental to the teeth, on this account in some degree. "Food acid," even in strong solutions, stimulates salivary secretion and has very little effect on the enamel, even during comparatively long physiological periods of exposure. I must again urge you to catch these points on the distinction between *mineral* acids and "*food* acids," in line with the chemistry of to-day. Dr. Nies should repeat his study of the corrosive effect of grape-fruit juice. I am very fond of grape fruit and eat it very often, but have never experienced any erosion or any removal of gloss or any superficial granulation of my own teeth.

It is probable that you see to-night the largest and most varied assortment of mucin and mucin salts ever publicly exhibited. Very few investigators have been interested in scientific studies of mucin from our practical standpoint. These products before you, and others we shall prepare, will be employed in an effort to determine the role of mucin in the formation of plaques and in the dental fixations of acid-forming bacteria and fermentable carbohydrate.

In one of my quotations from Pickerill's book it was asserted that there are many factors of importance in dental caries. Pickerill has not shown that we may disregard, or that we understand, the influence which heretofore has been attributed to mucin and mucin plaques. A continuance of work on our plans in this direction is very desirable, therefore.

As has already been indicated, we have prepared mucin from bovine salivary glands, not only because chemically it is practically the same as that from human saliva, but also because you, gentlemen, have declined to interest yourselves in the collection of human saliva from which the necessary quantity of mucin might be obtained. We appreciate the difficulties in the way of such co-operation, but at the same time we wish to urge that you make whatever sacrifices are necessary for successful consummation of our plans under your auspices.

This candid statement applies also to my repeated suggestion that you test the prophylactic efficiency of the proposed "food acid" treatment. For three years this subject has been before you—*placed before you as a result of work done under*

your auspices—yet in all this time Dr. Howe has been apparently the only one to give it so much as a trial. If you have sufficient confidence in us to ask us to proceed, it seems to me you ought to test our recommendations. If you do that promptly, you may discover excellent reasons for deciding that your resources in my hands are wasted.

Use diluted vinegar, or fruit juices—straight or diluted—or acid potassium tartrate or carbonated water, or any similar “natural” acid medium of a slight *degree* of acidity. Test the matter thoroughly. Determine quantities, number of applications, etc., for yourselves on a rational basis. Make many tests. Report your results in dental journals. Get busy on this line, and keep at it until we know whether the proposed treatment is valuable or not. How can you imagine there is any danger in it? If it fails to do good, it surely cannot do harm? Few therapeutic measures offer that happy alternative. It would be a serious reflection on the scientific spirit of your society if, after ignoring my very simple suggestion for three years, the proof of the utility of the proposed treatment should be presented by others—although you and I would rejoice just the same.

Let me read another statement by Pickerill which puts, in his own words, what I have said on several occasions in justification of the use of fruit juices and similar, slightly acid, media as dentifrices: “We are, therefore, justified in stating that the *total* amount of saliva poured out in response to acid articles of diet is more than enough to neutralize them, and is sufficient to exert a *neutralizing and cleansing effect in the mouth for a considerable period afterward*” (p. 140).

I have brought with me a second book by Pickerill, which I forgot to mention, but which you will doubtless find very interesting, and which I shall now place in your hands.⁸ His views, as I have quoted them, are reaffirmed in this later volume.

Those who may be afraid of the proposed treatment seem to forget that the distribution, with a brush, of a few drops of dilute vinegar on the teeth, to be removed by effective flushing almost immediately, cannot be more destructive of the enamel, cannot

⁸ Pickerill: *Stomatology in General Practice*, 1912, London. See also Wallace, *On the prevention of dental caries*: *The Dental Record*, 1912; Howe: *This Journal*, 1912, vii, p. 297.

cause the solution of more calcium from the enamel, than the ingestion of larger volumes of the same vinegar in salads and other food preparations, or the free use of orange, apple, grapefruit, and similar acid fruits in the ordinary diet. If the rational use of fruit juices as dentifrices is dangerous, shall we conclude that their use as food is not? This is a case of "up or down together," it seems to me. Acid is more apt to be *localized* when taken with food than when properly used as a dentifrice.

I have made this emphatic reaffirmation of my opinions at the risk of appearing to be unbalanced on the subject, but your respectful, though skeptical, reception of these suggestions is driving me to desperation.

Let me repeat, in conclusion, that it will be necessary to distinguish sharply between ordinary *mineral* acids, such as hydrochloric, nitric, sulfuric, phosphoric, etc., and "food (*organic*) acids," such as acetic, malic, tartaric, citric, etc. The mineral acids are *dissociated in high degree in their aqueous solutions*—are "*strong*" acids—whereas the organic acids are usually *dissociated in slight degree in their aqueous solutions*—are "WEAK" acids. The former must be regarded as dangerous in the mouth in all ordinary dilutions and should be carefully avoided in the proposed treatment.

I should be glad to confer with any dentist, at any time in the future, on any of the subjects we have discussed this evening.

Dr Linton moved a unanimous vote of thanks to Dr. Gies and Dr. Lothrop for their instructive papers.

Adjournment.

FIRST DISTRICT DENTAL SOCIETY, S. N. Y.

November 4, 1912.

DISCUSSION ON DR. EVANS'S PAPER.¹

Dr. Capon, of Philadelphia—When I was invited to discuss the essay just presented, I did not hesitate, when I saw what the subject was to be. The subject of preservation of the vital

¹ See p. 463.

pulp has always been one of great interest to me. There is an old adage that can be applied in our profession, which is very apropos; it is, "An ounce of prevention is worth a pound of cure," and I do not know of any place where it is more applicable in dentistry than when applied to the pulp. Many times I have a great deal of trouble in avoiding trouble, and I have to thank Dr. J. Foster Flagg for the many things he taught us as students, that have helped me very much in practice.

I believe there is no one in the country to-day who could have presented so many means to avoid killing a pulp in connection with mechanical appliances as Dr. Evans has. He is an expert in that particular line, and his drawings show him to be an artist as well as a dentist. I have nothing to criticise in his reverence for the pulp, and his efforts to show us how to avoid killing it, except it might be in some of these appliances. These I think would be rather thin ice for me to tread upon—not for him, but for me.

As to pulp protection, I feel a little bit at home in that line; I have practised a line of work that has enabled me to protect pulps perhaps as often as the majority who have been practising the same length of time.

During my first few years in practice I followed some of the lines we were taught in regard to protecting the pulp, some of which are advocated to-day. One of those methods which is still adhered to is the use of gutta-percha or temporary stopping over some sort of plastic to protect a sensitive nerve. Many have met discouragement through the capping of a pulp, because they have not understood that the temporary stopping or gutta-percha has become an irritant through the change of position, forcing the pad or medicament upon the pulp, and causing congestion if the dressing or capping is not removed. The loss of several patients early in my practice forced me to discontinue the use of gutta-percha under these conditions. I am speaking of a nearly exposed pulp. With an exposed pulp the pathological conditions, in the majority of cases, make extirpation necessary; but nearly exposed pulps can be protected and saved for many years if proper medicaments and care are used.

As to the adherence to certain ideas in regard to pulp sav-

ing, the question is open to as much criticism as the dressing of root canals. We each have our own ideas, the practice of which is regulated by experience. For many years I have used Jodoformagen, with a great deal of success, for exposed pulps. I know many of you have also used it. What your success has been I do not know; but mine has been splendid. Jodoformagen, as you know, is a combination of jodo salts, formagen, eugenol, and two or three other medicaments, making a very happy combination. It has been a splendid preservative in my hands. There is another one that I do not hesitate to speak a good word for, that I have been using for about a year, with very good results. That is "Velvo" capping. It is made here in New York. Dr. Musgrave told me, in response to my inquiry, that the essential ingredients are eugenic acid, argerol, ichthyol, basic oxide of zinc, phenat of soda, and the carbonate of the same, dissolved in alcohol and distilled.

My reason for using it is that he has succeeded in giving us a paste that becomes a hardened mixture when touched by moisture—something that is very desirable. I have taken out fillings frequently and applied this capping with absolute comfort to the patient in a very short time. Only recently I removed one that had some sort of metal cap, on the buccal surface of a third molar—a very difficult place to get at. It had been temporarily treated by a young practitioner, but the patient suffered continuously for several days, and only had relief after the gutta-percha cap and metallic disk were removed. I immediately applied the Velvo capping, sealing with a hard cement, and there has not been a particle of pain after two months' test.

These two cappings I know to be excellent for this purpose. I have often said, and will repeat it again—I will take the vagaries of a living tooth in preference to the almost assured troubles of a devitalized one, particularly in this part of the country where the humidity is so great and climatic changes so rapid. I am sure you have the same troubles here in New York that we have in Philadelphia, because the climate is the same. I know many dentists do not hesitate to extirpate the pulp, and they report it done as quick as a flash, and the trouble is all over. I have not arrived at such dexterity, and have not had the desire,

because I think Nature has been able to fill the interior of that canal with a pulp much better than we can with any of our preparations.

There are other methods of capping teeth, as demonstrated to-night, without devitalization. I have practised for twenty-two years a process of work that has proved its value. It is a process somewhat similar to Fig. 2, as shown by Dr. Evans—that is, the capping of living teeth by a process of crowning; but in this case using platinum in connection with porcelain. With this jacket crown most desperate-looking teeth can be made to do good service for a number of years without devitalization of the pulp.

After years of practice we have the opportunity of seeing at least a portion of our work, and can thereby judge of different methods, and gain a confidence that perhaps did not exist at first application. I have sometimes taken these caps off—perhaps they broke off, or perhaps the teeth loosened, and I have had opportunities of knowing what this covering of a tooth will do, and I assure you I am not devitalizing teeth any more now than I did years ago. Of all the teeth I have covered by this method—and they number thousands by this time—not more than 1 per cent. have ever given any trouble from the interior. I make this statement and feel confident that I am not far from correct.

In many cases I have in mind, the teeth are worn and abraded, but there is opportunity for the trimming of the tooth with the minimum amount of sensitiveness. You know we can take these sensitive teeth at the present time, with our injection of novocain, or peritundo, or other anesthetics, without doing harm, and reduce that tooth to the condition we require, and still not irritate the pulp.

There is one more thing that I think will help us in connection with the grinding of a tooth. Many dentists are afraid to use plenty of water on a good cutting stone. It does not take long to heat up a tooth, and cause an irritation that may be the death of the pulp later on. I attribute a great deal of my success to the use of a steady stream of water while trimming. This way prevents irritation.

Dr. Hutchinson—I think we are peculiarly fortunate in having this paper to-night, as Dr. Evans has presented it. For

many years, all over the country, men have been practising pulp extirpation, with the idea that they were conserving the interests of the tissue surrounding the teeth so treated. I agree with Dr. Evans and Dr. Capon in that I have always had the highest degree of respect for the dental pulp, and have advocated the saving of pulps in conditions which are not pathological. The tissues surrounding teeth having vital pulps, are more resistant to infection, or any source of injury, than those that are pulpless. It is a more normal condition, and if any benefit to the peridental membrane accrues from the removal of the pulp, it can be only temporary, for a balance will be re-established by Nature in a very short time.

I have practised pulp capping, and I believe I never removed a pulp from a tooth for the sake of attaching a crown or bridge, except in cases where it was necessary to use the root as an anchorage. The dental pulp has died under shell crowns, through careless work, many times. It seems to me reasonable to suppose that the pulp dies generally through overstimulation. Stimulation carried to a certain point is constructive, and beyond that it is destructive. Our friends, the orthodontists, know that to be a fundamental principle, and when the tooth is eroded, or caries has encroached, or attrition has worn a tooth down, the function of the pulp is to replace the lost substance underneath by a deposition of secondary dentin. Where the loss of tooth substance is sudden, as in extensive grinding for the fitting of a full shell crown, the pulp is overstimulated, and death is the result.

The method Dr. Evans has so beautifully described is one I have frequently seen practised, and always with the best results. The pulp is the nutritional organ of the tooth. Some claim has been made that when the patient reaches adult life, the pulp ceases to perform any function. It is the way of Nature to remove useless organs, and if its functions were finished, you may be sure Nature would have removed it in some way. More healthy conditions exist around a tooth with a normal pulp, and I know that to be the truth from careful clinical observation.

Where live pulps are in teeth, I have less trouble in the treatment of pyorrhœa than where the pulps have been removed.

The tissues remain in a more tonic condition, are less susceptible to injury, and make a better recovery after operation.

Another thing I want to point out, is what Dr. Evans has done in the way of sanitation. I wish other men would follow his example; there would be less trouble.

I have a large collection of cases where the pyorrhea has been caused by faulty construction—by an unsanitary condition resulting from that, and the impingement on or in the living structures. Dr. Evans's method has made sanitation possible. It is not only necessary that we should be able to clean the teeth, but that the patients should be able to perform their part of keeping them clean. In many cases, food debris accumulates, but with this construction, it is perfectly possible for the patient to keep the bridge clean.

I have gone over this with Dr. Evans, and I thoroughly and heartily indorse everything he has said.

Dr. Dailey—Pulp capping is a very delicate operation, and there should be a definite method of treatment.

In the normal tooth, calcification is often incomplete as late as the twenty-first year. If you have an exposed pulp to treat prior to the normal tooth calcification, please bear in mind that should you remove that pulp you are apt to have an irregular root apex. Such being the case, is it not better to prolong the life of that pulp and retain it at least until the tooth develops?

As soon as you remove the pulp from any tooth (especially before the tooth is normally developed), there is a change in the dentin. Whether this is due to infiltration into the dentin externally or internally, or decomposition of the organic contents of the dentinal tubules, the fact is that the normal color, yellow-white, of the dentin changes slowly to a gray, and with time gradually grows darker, no matter how carefully the root canals have been filled, or by what method; the color of the dentin changes by a chemical or pathological process. I cannot say which.

I believe the tooth pulp should be preserved at all hazards.

Dr. Gillett—Dr. Evans has shown us several valuable and interesting devices. His drawings are beautifully done, and several of the procedures he has illustrated are most interesting and

serviceable. All of the gentlemen who have discussed the paper so far have been indorsing what Dr. Evans has said. I am going to content myself with referring to two or three points in which I either do not quite agree with, or else I do not quite understand him.

There can be no question concerning the desirability of keeping alive every healthy pulp, but when it comes to preserving the life of pulps that have been reached by decay, it seems to me exceedingly difficult for the operator to find out whether or not he is dealing with an infected pulp, and if the pulp itself has become infected, I question very much the efficiency of any sterilizing method we have at our command for restoring that pulp tissue to a condition where it is safe to leave it—and by safe, I mean in a condition where the patient's comfort will be safeguarded.

Quite the opposite from Dr. Capon, I personally would feel less apprehension concerning a tooth where the pulp has been removed—extirpated by a clean, surgical operation—than I would concerning one in which there had been exposure of the pulp from any cause or even probable infection by reason of the close approach of caries.

I want to say a word concerning this drawing (Fig. 10). What I shall say concerning it is not in the way of criticism—because I recognize that this may be very useful in selected cases, but I refer to it because it illustrates a point I desire to make. It would seem possible that some of you, in concentrating your thought upon the preservation of the pulp, may be led into procedures which expose your patient to as much or more risk of harm in other ways. I can conceive of many mouths in which this device at the gum margin, projecting as it must at least one-sixteenth of an inch, overlying the gum, would not cause much harm. I can conceive of other mouths in which such a device would be the starting point for pyorrhea, and endanger life of the teeth.

In my estimation, the public is suffering more at the hands of our profession, because of unsatisfactory, unsafe and unsanitary crown and bridge-work attachments, than from overextirpation of pulps.

In my estimation, more teeth are being needlessly lost, because of incompetence and inattention in that branch of our work than are being lost by reason of pulp extirpation.

I agree with the gentlemen who have spoken so forcefully and so ably for pulp preservation, whenever they speak of a healthy pulp. The moment I am dealing with a pathological pulp, I desire, for the safety and comfort of my patient, to have that pulp out of the mouth. I believe all pulps that have been reached by caries (whether "exposed" or not) to be in an infected and therefore pathological state, and that many are infected even though a layer of hard dentin still covers the pulp.

Dr. Weld—Most of the speakers here this evening have spoken of the conservation of the pulp from a medicinal-treatment point of view. As I understand it, Dr. Evans's paper does not refer to pathological pulps. He entirely refers to mechanical devices to prevent the devitalization of healthy pulps, by properly adjusting bridge-work, so that the pulp may be preserved alive.

Take, for instance, Figs. 5 and 6, where there is a backing on the canine and the lateral, and the spud of gold, or some other metal, which is to support that bridge. It seems to me the plan he has suggested is infinitely better than to attempt to crown the canine by putting on an open face crown, which, as we all know, necessitates more or less grinding of the tooth on each side.

There is, I believe, in the city of New York to-day more than one dentist who never inserts a piece of bridge-work without first devitalizing the teeth which hold the bridge. I know one or two who advocate this. Doubtless this method is founded on the theory that grinding dead teeth is less painful than grinding live ones; but be that as it may, it has always seemed inexplicable to me how any painstaking, earnest, and intelligent dentist can persist in destroying a live nerve in a sound tooth.

I wish to thank Dr. Evans for one or two drawings in connection with his paper, which, I am free to confess, are new to me. I think he is entitled to the thanks of this Society for his most interesting paper.

Dr. G. R. Jenkins—I have been practising in New York

about fifteen years, and have gained a few things from experience. To the young men starting in practice, I would like to call attention to a sign which is often seen on railroads, for the protection of their employees—"When you're in doubt, take the safe side." Follow that rule with pulps. When the pulp is nearly exposed, and you want to put in a permanent filling or other permanent operation, it is my opinion such pulp should be devitalized. There is a point I would like to make, and that is if you pursue any certain line of action, take it up with all your heart. Become so perfect in it, that you know exactly what you're doing. There are many methods that bring about the same results. Become perfect in one.

I enjoyed listening to Dr. Evans's paper, because I felt "there is a man who knows what he is talking about." He becomes so perfect in certain lines, that when he attempts it, it is a perfect success. Some others may attempt it and not have the success, because they have not his secret. The whole secret is perfect adaptation, and Dr. Evans knows how to get it.

Many men are attempting to-day to put on bridges, when it is absolutely impossible to get the abutments perfectly fitted at the necks of the teeth, because they attempt to do it without devitalization. I see every day dentistry that makes me sick at heart, crowns that do not fit at the cervix of the tooth. I think we should be ashamed at the amount of that kind of work. We should not be so well satisfied with ourselves. A prominent physician tells me we are doing the public a great deal of harm, making them liable to cancer, which we know is often due to friction. Let us resolve not to permit rough surfaces in the mouths of the patients.

If it is necessary to devitalize a pulp in a tooth, do so. I would rather devitalize a pulp than not have my crown fit at the cervix of the tooth. We do not put enough emphasis on having the crown fit at the neck of the tooth, and you cannot always do that unless you get the bell-shape down sufficiently, and to do that you must devitalize the pulp in many cases.

We should criticise bad fitting crowns continuously, and emphasize the fact that they are making the patients liable to

incalculable injury. I should be glad if the little I have said will be of benefit to any one.

Dr. W. D. Tracy—I have been interested to note the trend of the discussion. It seemed almost as if the men were arraying themselves on two sides of the question; those men who never devitalize normal pulps, and those who do it quite frequently.

It is practically impossible for me to think of a man practising dentistry to-day, in the broadest sense, without his being ready and willing to devitalize a normal pulp when the best interests of the patient clearly demand that procedure. At the same time he should be willing, when necessary, to endeavor to save pulps by the best conservative methods, even though caries may have approached dangerously near the pulp chamber.

I am of the opinion that the full requirements of bridge-work cannot be met without taking out normal pulps, and when that is done by modern aseptic methods I know of no reason why it should not be done. Naturally, if the work is performed in a slipshod or careless manner, with no regard for surgical cleanliness, the prognosis will be unfavorable.

While Dr. Evans has made his position very clear as a conservative practitioner, where the pulp is concerned, I do not imagine that he wishes us to understand that he never removes normal pulps. We must consider the needs of the individual case, and if Dr. Evans is not willing to remove normal pulps in many instances, I feel that he cannot properly meet the requirements of all conditions.

Several years ago, I too, used to apply Jodoformagen paste, and even used it on actual exposures of the pulp, but my present point of view makes me feel that the element of uncertainty in this procedure is great. If I cannot save a pulp in the ordinary manner, I would prefer, as a matter of satisfaction to my self and safety for my patient, to remove it.

Dr. Dailey—There are so many dental clinics now performing operations for children, that I endeavored to call attention to the conservation of the dental pulp. If it is necessary to remove the pulp in a given case, remove it and treat as the case indicates; but all pulps should be treated and retained as long as they fulfill their function.

When the pulp has finished its function of tooth growth, if

necessary you can then remove the pulp with less danger of subsequent troubles.

Dr. Evans (closing)—In answer to Dr. Capon regarding gutta-percha covering a pulp and causing trouble, if gutta-percha be placed in a cavity, the walls and the decay of which are absolutely dry, there will be no expansion of the gutta-percha; but if it covers an area of decay where there is the least moisture, or where moisture can get to it, there will be an expansion in time. I have heard men state positively that a root, the canal of which was filled with gutta-percha, was liable to be fractured by the expansion of the gutta-percha. In that case the man who had treated the tooth did not hermetically seal the gutta-percha. The moisture may come from the decay left in a tooth, or from the antiseptics placed there; in either case expansion is liable to occur.

I have avoided the subject of the capping of exposed pulps in this paper. I say this to Dr. Gillett and others. If I wandered into that subject it would lead to an interminable discussion.

Pulps in which I suspect a pathological condition exists, I do not cap without thoroughly testing them. I put in the paste I spoke of, cover it with filling and leave it there for a week or two, and sometimes for a month or more. I consider this treatment worth the trouble—it would be to me if I were the patient.

I admire Dr. Capon's operations, and I have seen many of them—not only in his clinics, but also in a few cases of patients who have happened to come to my office.

As to trouble with pulps, as years advance, often in teeth with large fillings, we are liable to have calcification. Take a tooth with an immense metallic filling. After the lapse of years there are just as many pulps die from the presence of such fillings as there are from gold capping operations. You all know this from experience. I have found but a small proportion of pulps die from gold caps, although such a thing is possible.

As to sanitation in bridge-work, mentioned by Dr. Hutchinson, in the case, Fig. 8, what he referred to was the short caps on the abutments, and these spaces between the artificial teeth and the caps. In this bridge the artificial teeth are made with a large surface of porcelain resting on the gum. Porcelain is a

benign material in its connection with the tissues. No irritation comes from it. All a patient has to do is to take a surgical needle, or an ordinary needle from which the temper is removed and the point shortened, and with the needle carry floss silk through the space passing the silk between and under the artificial teeth. In this manner the bridge can be kept as clean as any removable bridge-work.

Dr. Dailey spoke of calcification. A man of his experience can tell pretty well by examining a tooth whether there is a complete calcification of the pulp canal, or if it is so nearly calcified that only a remnant of vitality is left. I discussed with Dr. H. M. Fletcher, of Cincinnati, who is quite a histologist and microscopist, the subject of calcification some years ago, and we agreed that in cases of entirely calcified pulps it is better to open up the canal, for the reason that in the examination of many specimens he found a slight vacancy up toward the apex where the calcification was not complete. This was attributable, possibly, to the fact that there was not enough vitality left to finish the process. Septic gases were liable to form and cause trouble in the uncalcified area.

Regarding exposed pulps, in making statements respecting them, I do not mean to say that I am infallible, but I give it as my opinion that every pulp that is exposed, is infected. The moment there is a puncture and a pulp becomes exposed, there is an infection. In the capping of decomposed dentin, septic gases, such as are described by Vaughan and Bierger, are sealed up and liable to cause trouble. You must be sure you are rid of all septic conditions before you cap a nearly exposed pulp, and especially an actually exposed one. Many dentists in treating such a tooth, apply carbolic acid and use the hot air syringe, but this is not sufficient. I apply essential oils with aristol or make application of the paste I speak of, and leave this there for a time.

Dr. Weld seems to have understood the points of my contention quite clearly.

In reply to Dr. Jenkins in regard to what ought to be saved and what ought not be attempted, that is a matter of experience that will come in time. I advise to experiment first with the decayed tooth and see if the pulp is going to live, and not put your

patient through the torture of having failure supervene and probably have an abscess form.

In answer to Dr. Tracy, I have not maintained in this paper that pulps should not be destroyed sometimes. I destroy a pulp when I am obliged to, but every time I do it, I say to myself: "It would have been better if I could have saved it." That is the reason I brought here and exhibited some methods by which I often get around it. I endeavor to avoid this destruction of pulps that is indulged in too freely to-day.

Regarding this last case, Fig. 10, showing a removable bridge attachment criticised by Dr. Gillett, this little flange that sticks out here does not go to the gum. It leaves a space between the metal and gum which the patient, with a piece of floss silk, will easily clean perfectly. I do not think there is nearly so much injury produced by the presence of that little flange as from the wearing of a piece of removable bridge-work which has to be attached clear down to the cervical edge. I have seen but very few operators who attach as illustrated. I do not like to have the gingival margin impinged upon by anything. I always want a space between the dummy tooth and the cap at that point.

As to the function of the pulp, referred to by Dr. Dailey, I think the function of the pulp ends when the patient ends, and that is my contention. I have never seen the pulps dry up and calcify at any age in teeth which are normal. They last. Where they do otherwise it is because there is some abnormal condition present, either an excessive abrasion or something else.

Adjournment.

FREDERICK C. KEMPLE, D.D.S., Editor,
First District Dental Society.

AMERICAN ACADEMY OF DENTAL SCIENCE

October 2, 1912

The first meeting of the season of 1912-13 was held at Young's Hotel, Boston, Mass., on Wednesday evening, October 2, at six P. M.

The president, Lawrence W. Baker, D.M.D., in the chair.

After dinner had been served President Baker introduced the speaker of the evening, Dr. George H. Monks, who made the following address:

Dr. Monks—It gives me great pleasure to be here to-night. When your representative, Dr. Hadley, asked me what subject I would take, I told him that I would talk on the subject of the tongue, that unruly member, which is sometimes more troublesome even than the teeth. The tongue, of course, is the special organ of taste. It also has to do with mastication, and with speech. We are not all of us so familiar with the anatomy of the tongue, but that it may do us some little good, perhaps, to consider it in connection with the diseases of the tongue. The tongue consists of an upper side and a lower side. The upper side is divided very roughly in the median line by a furrow. Its surface is covered with numerous little papillæ, in which the various nerves terminate. The under side is covered with mucous membrane, in which there are a few glands. The ducts of the submaxillary and sub-lingual glands open on or near the base of the tongue. The under surface of the tongue is connected with the lower jaw by a number of muscles. Some muscles are intrinsic to the tongue and some are extrinsic. The extrinsic muscles are the hyo-glossus, the genio-hyoglossus, the stylo-glossus, and the palato-glossus. These all connect the tongue with other parts. The intrinsic muscle of the tongue is the lingualis. The tongue is, in fact, largely made up of muscles, with some fat lying between the fibres. The fibres of the muscles run in different directions; often even at right angles to each other. The principal artery of the tongue is the lingual artery, but there are also branches from the facial artery, and from the ascending pharyngeal artery. The nerves of the tongue are four. The nerve of ordinary sensation, the nerve by which we know when the tongue is touched, or by which the sensation of pain is conveyed, is the gustatory nerve, whose terminations go to the little papillae on the front sides of the tongue. The special sense of taste is supposed to be confined to the branches of the lingual nerve, which of itself is, of course, a branch of the glosso-pharyngeal. The terminations of this nerve go to the mucous membrane and papillae at the base and side of the tongue.

The nerve of motion of the tongue is the hypo-glossal nerve. It is distributed to the various lingual muscles. The lingualis muscle is supplied by the chorda tympani. The tongue may be subjected to certain injuries, the commonest being from the teeth. I have a picture of a tongue nearly bitten in two—a case I saw at the City Hospital, where a little boy fell, striking on his chin. The treatment for that particular injury would be the same as for the same injury elsewhere; that is, to draw the parts together with stitches and hold them there. The circulation of the tongue is so very good that, in spite of bacteria, recovery is usually uninterrupted. There are also burns and scalds from hot fluids, caustics, etc. Only within two or three weeks, a patient of mine told me he had been in the hospital; and the nurse, considering it necessary to sterilize the clinical thermometer thoroughly, put it into pure carbolic acid, and then deposited it under his tongue—a procedure which naturally inflicted some little damage. It took the patient two weeks fully to recover from the caustic effects of the acid. Foreign bodies may be lodged in the tongue; pipe stems, even a tooth has been forced into its substance and, you might say, has been lost for a time. Bullets also have been known to find lodgment there. There are certain diseases, to which the tongue is subject in common with other parts of the body. Such conditions, when appearing on the tongue, are oftentimes difficult of diagnosis, however. Certain conditions, however, are peculiar to the tongue. One of these is the existence of fur on the tongue. Much has been said and written and many observations have been made about fur on the tongue. If the tongue is coated, the stomach is supposed to be out of order, and yet this does not necessarily follow. The tongue is said to be a little larger when the blood pressure is high, and smaller when there is low blood pressure. It is said also that the tongue shrinks in excessive thirst. Indentations on the tongue represent impressions made by the teeth, they have no special clinical significance, but they are marked in oedema of the tongue. The tongue may be the seat of fissures, or clefts which are usually associated with general diseases, such as syphilis, in its late stages. An interesting condition of the tongue is that to which the name of geographical

tongue has been given. It is sometimes called "wandering rash." It is almost always in children, and no cause is known. There are circular patches on the tongue which sooner or later overlap each other, showing an irregular border to the denuded area. Even in a few hours the appearances may change. This condition has been called the "geographical" tongue, because it suggests the irregular outlines presented by most maps. Hypertrophy of the tongue may be either congenital or acquired. It is due to the enlargement of the lymphatic vessels, to the enlargement of the capillaries, or may be the result of an old inflammation, where the tongue becomes chronically swollen. Sometimes the hypertrophy is so great that the tongue hangs out of the mouth. There is very little to be done for hypertrophy, except to take away the excessive portion of the tongue so that the stump may be kept within the oral cavity. Atrophy of the tongue is sometimes general, but is usually one-sided. It is supposed to be due to some nerve trouble. There is very little to be done for this condition. To a certain extent electricity may be of assistance in enabling the person to articulate a little better.

An acute inflammation of the tongue may result from the use of mercury in specific disease. The tongue becomes red and swollen and presents all signs of inflammation. This goes on until finally the swelling is so great that the tongue protrudes from the mouth and saliva drops involuntarily. Occasionally, abscess occurs in the tongue. This is not common as a result of glossitis, but occasionally appears even without apparent reason. Fluctuation may be made out, as the pus comes to the surface and the yellowish color may be made out through the ~~thin~~ surface of the tongue. The abscess is usually in the middle. Chronic glossitis is not very often met with, but sometimes results from excessive smoking or chewing. It is sometimes present in syphilis in a very marked degree. The mucous membrane may be stripped off, and fissures and cracks may appear. It is in such cases that you may see white patches constituting a condition known as "leucoplakia." These white patches have no special significance, except that growths are apt to form, especially cancer. An excessive smoker who has leucoplakia of the tongue should look out, lest cancer develops; and it is therefore

very desirable that he give up smoking, in order to remove at least one source of irritation. Various ulcers and nodules may occur on the tongue or lips. The common nodules often present great difficulties in diagnosis. Nodules may be associated with general diseases, as tuberculosis, or syphilis, or they may be cysts or tumors. You are, perhaps, very familiar with ulcers on the tongue, one of the most common being the traumatic ulcer, due to some definite injury, or trauma. The dental ulcer is due to sharp teeth, or to injury from some dental appliance. Herpetic ulcer rather suggests some disturbance in the digestive tract. Tubercular ulcers are usually near the tip of the tongue; ulcers are not infrequently connected with specific diseases. Of the tumors of the tongue, some are benign, and some are malignant. Benign tumors of the tongue are as a rule, papillary growths which are very common and of no special significance. It is a very easy matter to remove them, and to cauterize the base. Other benign tumors, such as naevi, fatty tumors and cysts may occasionally appear in the tongue. Sarcoma of the tongue has been known; but it is very rare. Unfortunately, carcinoma is not so uncommon, and it is one of the worst diseases man can have. A person with well advanced cancer of the tongue is a most pitiable object. Cancer may start anywhere on the tongue. I have seen the disease almost everywhere except on the tip. Ordinarily it appears on the sides or edges of the tongue, where the teeth touch it. Therefore, you are forced to the conclusion that the irritation from the teeth has something to do with the development of the cancer. On the other hand, it may sometimes be in the body of the tongue, and I have seen it in the median line, so far back that you could not see it unless the patient made the motions of swallowing. The natural course of the disease, if nothing is done for it, is from bad to worse. Sooner or later pain is pretty sure to be a prominent symptom. Then there is difficulty in speaking and in chewing food, as well as difficulty in articulating. The patient grows weaker and weaker, not only because of the disease itself, but also because he cannot eat the proper food. He becomes more or less "septic," and may have hemorrhages from time to time. Finally, if no treatment is instituted—he dies from sepsis, from starvation, from ex-

haustion, or from some internal complication. What is there to do for cancer of the tongue? There is very little to do, except early operation. If cancer of the tongue exists, the sooner it is operated on the better. If the growth is far advanced, it is a question whether an operation should be performed or not. Ordinarily, in operation for cancer of the tongue, one should remove the whole tongue. If the growth is confined to one side of the tongue, and it is in the early stages of development, it might suffice to remove only that half of the tongue.¹

Discussion.

Dr. Baker—This is certainly a very able presentation of the subject. It is easy to see why Dr. Monks holds the position of Professor of Oral Surgery at Harvard University; and we can all readily understand why the students find his course of lectures so interesting, and also why these lectures make such an indelible impression upon their receptive minds. The subject is now open for discussion.

Dr. M. C. Smith—Mr. President, if you will allow me, I will pass around a specimen of cancer of the lower jaw which I removed last week. This is very close to the subject brought up for discussion this evening. This is a sarcoma. It had a good line of demarcation and the surrounding tissue was not infiltrated. We dissected down on the outside and with a circular saw in the dental engine, cut the jaw longitudinally below the alveolar process and the growth. Next dissected down on the inside, cutting the genio-hyoglossus muscle. We picked up the cut muscles under the tongue and stitched them into the tissue of the lip. It is very important to pick up all of these muscles and attach them somewhere; if there is anything that is painful and annoying to a patient, it is to have a few fibres of those muscles under the tongue left loose: a good deal of care is necessary not to include the ducts of some of the sub-lingual glands: should you tie a duct in your suture you will get into worse trouble than to leave it loose. If you have not had any experience in putting a stitch in the tongue, where it has been

¹ Here Dr. Monks exhibited pictures of the tongue on the screen, and explained various methods of operating.

bitten, or cut, your first attempt may cause you considerable perspiration. If you attempt to sew the tongue, drawing your stitches with the longitudinal fibres of muscle, you will find that they will slit out, and if you happen to get a case of that kind, I would advise you to put in double sutures, so as to stitch crosswise of the muscle first; then put your stitch in through the suture and tie both together. Do not attempt to tie with the longitudinal fibre of the tongue. There is a condition of the tongue which has been giving the dentists and surgeons a heap of trouble, where they have operated for enlarged growths in the tongue, and found that the enlarged growth was a detached portion of thyroid gland, and in reality it was "goitre." A fatal termination may be the result unless you have first made the diagnosis of thyroid gland in the tongue, and acted accordingly. As this is my first meeting as a member of this society, I appreciate the honor very greatly of being called upon to open the discussion of such an able paper as we have had this evening. I expect a very pleasant relationship with this society. I propose to ask the co-workers to assist me in some of the work that I intend to attempt. I shall appreciate the good advice of this society, and do appreciate the assistance I have had from Professor Monks. He was my professor in special pathology while I was at the Harvard Dental School, and has been a friend, ever since, to whom I often run with cases that bother me, and I can assure you that if you ever have any trouble with the mouth, and you are in doubt as what to do, take it to Dr. Monks, and he will give you good, sound advice.

Dr. L. M. S. Miner—Mr. President, and members of the Academy. It has been my good fortune to have worked under two men whose reputations for their knowledge and skill in matters of surgery have not been limited to Boston. Dr. Thomas Fillebrown, whom many of you have known and loved, and Dr. Monks, with whom I have the honor to be associated at the school at the present time. In connection with Dr. Monks' subject, I recall two or three cases of which I wish to speak briefly. The first case was one of glossitis, also connected with stomatitis, due to the use of peroxide of hydrogen. The patient was a young man, thirty years old, a bank clerk. He was very par-

ticular about his personal hygiene, and an enthusiastic user of peroxide of hydrogen (half strength, sometimes pure). He took a trip to Chicago, and on arriving there, as his mouth and nasal passages were filled with smoke and dust, he began to use the peroxide very freely. When he returned to Boston he presented one of the worst cases of inflammation of the tongue that I have ever seen. It filled the entire lower cavity. There can be little doubt but that this came from the use of peroxide of hydrogen. On a similar trip, where he used the peroxide, he had symptoms presenting somewhat the same conditions. The entire discontinuance of the use of peroxide of hydrogen, with other treatment, cleared up the tongue in a short time. I have kept in touch with him, and he has never had another attack. I have also seen several other cases, not especially limited to the tongue, but where there was inflammation of the mouth due to the too thorough use of peroxide of hydrogen. I had a case much like the one to which Dr. Monks referred, where specific tongue was suspected. This was due to excessive smoking. The man was a cigarette fiend and smoked several boxes a day. The tongue presented very deep furrows, and the pain was almost unbearable. Any acids or sweets getting into the furrows made the tongue smart, so that he had not been able to eat with any degree of comfort for a year.

As Dr. Monks has suggested, the best surgical treatment is the removal of the cause, and I advised the discontinuance of smoking. He said "I have been told that by several doctors—I thought you might suggest some other way of treatment, but allow me to continue to smoke." Another case, which presented itself at the School—a man of about fifty years, of Russian nationality, where the sense of taste was entirely lost on one side, following the insertion of a bridge from the cuspid tooth to the molar. The bridge was gold, with a gold crown on the cuspid and also on the molar, with gold abutments between. The gold itself turned a very peculiar color. A few hours after the bridge was put on, the patient lost the sense of taste completely. We saw him at the School about three weeks later, and in testing the tongue locally with the four elementals—sweet, sour, etc., we could not detect any loss of taste except sweet. The other

tests were apparently normal. We kept in touch with him for a month or two, and gradually the sense of taste returned. The cause for this we were unable to determine. Another matter which is close to my heart is that of malignant growths of the tongue. I think as a profession we have a great responsibility, because many of us, especially those who are general practitioners, see these cases of malignant growth of the mouth and tongue very early, and no one knows, perhaps, any better than I do, because of a recent experience, the difficulty in diagnosing these conditions. As Dr. Monks has already so well indicated, early diagnosis of malignant tumors, not only of the tongue but elsewhere, is of distinct importance. The early symptoms are many times noticed by the dentist before the surgeon has a chance to see the patient. I have had one or two cases where the patient has come to me for a peculiar stinging sensation, not exactly an ache, which bothered constantly, and which was not amenable to treatment. In following up those cases and keeping in touch with them, I found in two cases the development of what proved to be malignant growths; so that is a point which might well be borne in mind. Of course there are cases that develop without preliminary warning, and develop rapidly. Sharp teeth and irritation from plates have to be thought of as causative factors in these cases. It seems to me we must all be on the lookout for these malignant conditions, and where they are suspected, have the cases investigated pretty thoroughly before they become well advanced.

Dr. C. H. Taft—I do not feel that I can add anything of value to the discussion, but I want to express my thanks for the instruction I have received to-night, which interests me particularly because of a personal friend who has recently been taken to the Huntington Hospital. This man was an intimate friend and patient of the late Dr. Maurice Richardson, and was operated on during the past year for a glandular growth, which later developed into cancer. This gentleman has been an inveterate smoker, and it was the opinion of his dentist, also of Dr. Richardson, that it was nicotine which caused or promoted the cancerous growth. I am sure that if I ever have any lesion in my own mouth, much as I love to smoke, I should certainly

quit, until it was cured. In this case the trouble started with a jagged tooth, which was allowed to remain for a considerable time, until it had cut into the mucous membrane in the cheek. I saw this man a week ago last Saturday. The right side of his face is very much distorted; he has hardly any use of his tongue, and the right eye is entirely closed. He is simply waiting for the inevitable end. The only other case that has come under my observation during the past year was a woman; a patient of a friend of mine in the same office building. The latter called me in one day to look at an ulcer under the tongue, in the region of the right lower molar. The woman had been under the care of several physicians and surgeons, who had recommended different things and various methods of treatment, among others, the extraction of all the teeth on that side of the jaw. Neither my friend nor I could discover that the teeth had any connection with the condition of the tongue. I suspected the ulcer was a syphilitic one which opinion my friend also held, and a pathological examination proved this to be correct. The patient's condition rapidly grew worse, and cancer developed. Within a few months, the woman, who by the way was a confirmed cigarette smoker, had died. I speak of these only as interesting cases that occasionally come under the observation of the general practitioners.

Dr. Monks—In connection with the subject of injuries to the tongue, I wish to call your attention to an instructive case. About six months ago a well known dentist was using a sand paper disk in the mouth of a very talkative patient. The patient rapidly moving the tongue came in contact with the disk, and a deep wound near the frenum resulted. As the resulting hemorrhage was profuse, and the dentist could not control it, he brought his patient to the hospital at once, where I saw him; evidently one of the ranine arteries had been divided. A few deep stitches controlled the hemorrhage. I speak of this case, as showing the necessity for silence on the part of the patient, while the sand paper disk is being used. In regard to the question of the use of tobacco, as contributing to the development of cancer, I do not know that anything can be said definitely about it. It is generally conceded, however, that any long con-

tinued irritation may have some part in causing cancer; and the long continued use of tobacco is, of itself, an irritation. I think it is very interesting to hear what Dr. Miner has said about the "stinging sensation." I think very likely that that stinging sensation which he refers to as having been noticed by him before cancer appeared, was due probably to a little abrasion of the mucous membrane which his patient noticed before the cancer appeared. Possibly this resulted from the effect of the nicotine, or some little crack or ulcer, which had up to that time not been noticed. I would suggest that in your work, if your patient makes any such complaint, you should inspect carefully to see if there is not some little abrasion which can be healed by simple remedies. I really cannot emphasize too much the importance of the duty which dentists have, in seeing that the sides of the tongue are in good condition, and that any complaint of pain, distress or "stinging" should be investigated and treated, and that the inner aspects of the teeth which come in contact with the tongue should be made as smooth as possible.

Dr. Miner—I would like to ask Dr. Monks what relation heredity bears in carcinoma or cancer—what the history of cancer in the family has to do with cancer in the progeny.

Dr. Monks—I am hardly prepared to answer that question because so little is known about it. I do not think it has been established by scientific investigation that heredity surely plays a part. It is likely, however.

Dr. Smith—In my experience in malignant growths in the mouth, I have seen quite a number of very small growths that have been diagnosed by the microscope as malignant cancer or sarcoma. I have never leaned towards the theory of irritation. In no case where I have seen a small growth that has eventually proceeded to develop into cancer has there been any sign of irritation. It is generally in a protected place. In that case which I have passed around, I think the cancer developed in a protected place, under the upper plate. It had been there for many years. Irritation may produce a fertile field for graft, but if there is a growth developing I should feel it was more likely to be a graft than any other condition. I have never seen a case of small growth that I thought could possibly be attributed to irritation.

Dr. Monks—I think if you ask the men who investigate the subject from a scientific point of view, they will tell you that irritation in some form has something to do, probably, with the development of cancer in many cases. That cancer may develop in some cases without apparent irritation is certainly true.

Dr. Smith—I would like to ask Dr. Monks what he thinks of grafting cancer cells to other patients. Could cancer cells be transferred to other cells?

Dr. Monks—Experimentors have been more or less successful in grafting mice and rat cancers, but, of course, that is not human cancer. I do not know of any case where cancer has developed from grafting of human cancer cells, but surgeons in removing a human cancer are very careful to cut only the sound tissue, and to remove the whole disease, if possible, in one piece.

Dr. Miner—There have been, comparatively recently, several men fired with zeal to discover new facts in regard to cancer, and willing to sacrifice themselves in experiments for the grafting of human cancer, who have had pieces of cancerous tissue grafted in some portion of their bodies. In no case has any cancer developed in any of these investigators.

Adjournment.

WILLIAM RICE, D.D.S., D.M.D.,
Ed. American Academy Dental Science.

**THE BOSTON AND TUFTS DENTAL ALUMNI
ASSOCIATION****OCTOBER 9, 1912**

The first meeting of the season of 1912-13 of the B. and T. D. A. A. was held at Hotel Thorndike, Boston, Wednesday evening, October 9, at 6.30. Only business of a routine nature was taken up. Dr. W. A. Tannebring, of Beverly, was elected to membership.

Records of previous June meeting read and approved.

Secretary Dr. Worthing spoke in regard to the "wholesale" admission of graduates each year, and suggested that this method be changed. Suggested by Treasurer Dr. De Witt that this matter be left to the Executive Committee to report at next meeting December 11. This was carried.

Meeting was adjourned to the banquet hall, where an excellent dinner was served. The tables were beautifully decorated with oak leaves, and all were well pleased with the arrangements.

After satisfying the inner man, the speaker of the evening, Hon. A. L. Cutting, of Weston, was gracefully introduced by the president, Dr. Arnold. The speaker's topic was "The Human Element in Business." To judge from the manner in which the speaker handled his subject, it seemed that he had a thorough knowledge of the science and art of salesmanship. It perhaps may be thought by some that the topic was not of primary interest to professional men, but such surely was not the case. As the speaker clearly brought out, we are all salesmen, and when the last analysis is made, it is the man best qualified to get the interest of his patient or buyer who succeeds best.

The fact that the clerk behind the counter was either a salesman or merely an order taker was clearly brought out. The difference was shown between the two qualities.

Mr. Cutting described the three rings of sales craft, and what they signified. Many instances were shown of the human element as it entered into the success or failure of any business, whether that of a professional man or otherwise.

Mr. Cutting is the New England agent of the Sheldon School of Salesmanship of Chicago. It was quite evident that he is the right man in the right place.

The next meeting of the association will be held December 11 at Hotel Thorndike. The speaker will be Hon. Samuel J. Elder, who will have for his topic, "People I Have Met." A most interesting and profitable evening is sure to result, and all members are urged to attend. Ample notice will be sent to the members.

At the annual meeting in June the following officers were elected:

President, Dr. W. H. Arnold.

Vice-President, Dr. L. N. Parker.

Treasurer, Dr. N. A. De Witt.

Secretary, Dr. Anne S. Worthing.

Editor, Dr. A. G. Richburg.

Executive Committee: Dr. H. N. Adams, Dr. E. K. Fish, Dr. A. G. Richburg, Dr. C. R. Given.

A. G. RICHBURG,
Editor B. and T. D. A. A.

NOTE.—THANKS TO PROFESSOR GIES.

The Editor acknowledges with thanks the good humor and practical sense conveyed in Professor Gies' suggestion concerning the title of this publication.¹ THE JOURNAL smiles, metaphorically but cordially, with Dr. Gies, and will give the matter due consideration.

¹ See p. 408.

THE JOURNAL OF THE ALLIED SOCIETIES

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VOL. VII

NEW YORK, DECEMBER, 1912

No. 4

EDITORIAL DEPARTMENT

WHAT IS "PROFESSIONALISM"?

In the current issue of the *Dental Cosmos* there appears an editorial under the title "Professionalism." This topic is one which will always invite discussion, for it is or should be a subject daily in the minds of men who practise a profession. The views expressed in the article referred to are of a general nature, and possibly not intended by the writer for close application; but certain statements, while admirable in themselves, seem rather Utopian in their drift, and it may be profitable to consider their value in daily conduct.

After dwelling upon the vagueness of current conceptions of the term "profession" or "professional," the point is made that these words "have no proper use in connection with the barter and sale of material things," and this position is elaborated in the following statement:

"No one has ever heard of a professional clothing-dealer or ironmonger, or of the term being connected with anyone exclusively engaged in the sale of merchandise of any sort. Nor does it appear that the activities of trade furnish any outlet leading toward professionalism in any proper use of the term in the light of its accepted meaning. On the other hand, the producer of things, the craftsman, the artisan, is constantly influenced by the tendency of his constructive art to develop toward professionalism, which it necessarily does in proportion as it advances in excellence as a result of the intelligence and skill expended upon it. The ordinary house-painter is a craftsman whose pecuniary reward is based upon the value of his labor and the sale of the materials that he uses in his work; the artist, whose work embodies the material expression of an inspired intelligence, is rewarded not at all on the basis of the value of the materials he uses, and little, if at all, for his mere manual or technical skill, but essentially and in a broad sense wholly for that materialization of his intellectual conception which his picture portrays. The fee of the artist is the reward of professionalism, and not the wage of the craftsman or laborer."

The concluding sentences follow:

"Fortunately, dentistry is slowly discovering that its reward does not come from selling things, but for a service of brain and skill in combating disease and remedying its ravages. When it is generally recognized that the justification for a fee is only the skill and intelligence embodied in a service rendered, then shall we have shaken off the incubus of commercialism and advanced to the dignity of a professionalism worthy of the name."

The subject is narrowed to the ethics underlying professional fees. Strictly speaking, it is unfortunate

that the artist or dentist or other professional man should have the clear vision of the work before him sullied by considerations of monetary gain; but this he must do, of necessity, for he must live comfortably, care for his family, and provide for his old age. It is held universally that a man shall be paid for his work. Therefore the entire question for present discussion is what this work may consist of and how its value may be estimated.

The inspired work of an artist may be valued upon a basis which is purely arbitrary. Two dollars' worth of canvas may sell for one hundred thousand, and in such a case it may truly be said that no material thing has been bartered and sold. But the values to be set upon services rendered the human body cannot be reached in this way. The general physician, or the dental specialist, can hardly say to his patient: "This operation is inspired work—a masterpiece—and must be paid for accordingly." If he did so he would be reminded promptly of much other of his work which was not inspired, and therefore of problematical value, though such other service may have cost the practitioner great care and anxiety. Carried to a logical conclusion, this method of appraisal would leave the patient at the caprice of the man rendering the service. The man who buys a picture may judge for himself of its merits, and he pays for what is clearly before him, but of the value of an operation upon his body he must defer to the judgment of the operator, whose opinion

may not be impartial. He may leave the picture if he can't afford to buy it; a man can be a decent citizen without patronizing the fine arts; but he cannot be useful or happy under physical disability. He must have relief without danger of subsequent bankruptcy. Therefore the public demands with justice that some custom shall control medical or dental fees, and without some such accepted custom any confidence between practitioner and patient is impossible.

It is established, then, that the professional man must be paid, and that the public also shall be protected from overcharge by the tacit understanding that a fee is to be estimated in accordance with some plan. What shall this plan be?

To be sure the skill and intelligence employed constitute the true basis of valuation, but this is controlled by the public's interest in the matter, and the resulting compromise is an arbitrary judgment. Many thousands of such judgments establish a more or less definite custom, and hence the surgeon's fee is so much per operation, or the physician's so much per visit, or some other arbitrary ruling. From the direct saving of life down through the long gamut of benefits bestowed, the recompense involved bears virtually no relationship to the importance of the service, and little to that of the skill employed. Whoso departs radically from local custom in this respect falls invariably under suspicion of commercializing the skill he possesses. *And herein lies the true altruism in the conduct of all those who minister to the human body, or any part of it.* It is the distinguishing mark of the professional man, which prevents his becoming a millionaire and places him forever among those honored of mankind.

From the nature of his work, other factors enter into the dentist's fee. His operations require much time, and as his skill becomes standardized, time becomes a fairly trustworthy measure of the amount of skill expended in a given case. In his prosthetic work, and elsewhere, precious metals are used. With every deference paid to the opinion which is being reviewed, we submit that material things form part of the value of most dental service, and must do so while our work includes restorative operations. It would be difficult to regard as a negligible item the gold and platinum consumed during the year in a full dental practice, without so exalting our fees as to make dental service available only to the fortunate rich. We are also unconvinced that the present essential nature of dental science and art is incompatible with true professionalism.

That preventive measures will supplant those of repair or restoration in dentistry is the most earnest hope of all worthy men. But we will hold to what is already useful, until that which is better shall arrive. Several generations may pass before dental caries is fully understood and brought under control, and the children of to-day have cavities already formed which we of this generation will spend the rest of our lives in filling, or caring for in some reparative way. So there seems to be no immediate likelihood of radical change, though all are looking for the light.

NOTES ON PRACTICE

COMPILED BY WILLIAM D. TRACY, D.D.S., NEW YORK CITY

Influence of Mastication on the Conditions of the Teeth.—Investigations on the children in the town of Koetzling, in Bavaria, show that of those who eat hard bread, the percentage with bad teeth was 6.9; of those who eat both hard and soft bread, 8.2; of those eating only soft bread, 10.5. In the town of Ihringen (Baden) the percentages before and after the introduction of soft bread were as follows: In 1894, when only hard bread was eaten, 12.4 per cent.; in 1897, just after soft bread had been introduced, 12.9 per cent., and in 1901, when most of the bread consumed was soft, 20.9 per cent.—*Dental Record*.

Alum for Perspiring Hands.—Operators whose hands perspire easily will find an alum cake, such as barbers sometimes use, very serviceable for rubbing their fingers on and rendering them dry.—*Le Laboratoire et le Progres Dentaire*.

Temporary Stopping, Especially for Hypersensitive Cavities.—One of the most useful temporary stoppings, especially in the case of sensitive cavities, is a mixture of Fletcher's artificial dentin with the addition, after a mix has been made, of a drop or two of oil of cloves. When this is well mixed, some shreds of cotton are incorporated, and the stopping is placed in the cavity, mopping off the excess of moisture. Used in this way the dressing will last for many weeks, if necessary.—J. J. ARM-ITAGE, *British Dental Journal*.

Japanese Treatment of Syncope.—A method worth noting, which they term Knatzu, is employed by the Japanese, according to the *Scientific American*, in the treatment of severe fainting spells. It consists in striking repeatedly with the closed hand—doubtless the padded external edge of the palm—the most prominent of the vertebræ at the base of the neck, the seventh. Whether the successive shocks produce reflex contraction of the general arterial system and thus cause resumption of the cerebral circulation or not, the fact remains that the normal action of the heart and consciousness are restored. The patient is then

seated, and his arms are given a rotary movement, which, possibly by causing traction on the deltoid, or reflexly, enhances the circulatory and respiratory activity. He is also required to walk, to increase the circulatory activity in the lower extremities, a precaution which, from the Japanese viewpoint, prevents recurrence of the syncope.—*New York Medical Journal*.

Arrangement for Sterilization of the Operator's Hands.—The first step in any dental operation should be the preparation of the operator's hands. It is not allowable for him to go from one patient to another without thoroughly washing his hands, and it is not sufficient simply to wash with water. Soap should be generously used. A faucet of flowing water should be arranged, which is operated by stepping on a little button protruding through the floor. Three objects are gained by this: The hands are washed and rinsed by flowing water, which is preferable to a bowl of water; they do not touch a faucet handle, and they are warmed. A dentist should not touch a patient's face with cold hands. The tincture of green soap serves not only as a soap, but is one of the best sterilizing agents for the hands.—L. E. CUSTER, *Dental Summary*.

Suggestions for Safe Nitrous Oxid and Oxygen Anesthesia.—To produce a prolonged nitrous oxid and oxygen anesthesia, free from muscular spasm and as smooth and tranquil as that produced by any other anesthetic, it is necessary to eliminate cyanosis and all other evidences of asphyxia, a thing more easily said than done. The following suggestions, if followed carefully and technically, will make possible such an anesthesia:

Have a continuous flow of both nitrous oxid and oxygen under positive pressure. Use warm gases, as a more tranquil anesthesia will be induced, and there will be no post-operative bronchitis or pneumonia. Maintain depth and character of anesthesia, not by turning off and on the nitrous acid, but by regulating the supply of oxygen. Watch the patient closely and learn to anticipate symptoms.

When it is taken into consideration that the patient recovers from this anesthetic immediately, regardless of the time he has been under its influence, that there are no after-effects either

upon the lungs or kidneys, that it can be given safely to patients who could not live under ether or chloroform, is it to be wondered at that nitrous oxid and oxygen anesthesia is growing in favor? Scientists are slow to adopt new methods, but it is the opinion of nitrous oxid and oxygen experts that in the near future this form of anesthesia will be given preference in all of our hospitals.—A. HALL, *Dental Summary*.

Simplified Procedures.—Ill-fitting clasps are the cause of many troubles in sound teeth, as we all know; therefore a perfectly fitting clasp is a most important factor in the making of a satisfactory denture. The first essential is a perfect model of the tooth to be banded, and this should be obtained from a plaster impression. A piece of thin tin foil is burnished around the tooth, and on it a piece of thin wax plate is pressed, and trimmed up with a sharp knife to the desired breadth and shape; the band and foil are removed together from the tooth, the foil is peeled off, and the piece invested and cast in the usual way, using band gold. In this way a perfect fitting clasp is obtained which conforms to the contour of the tooth.—P. S. HUMM, *American Dental Journal*.

To Relieve Pain While Opening a Tooth on Which There is an Acute Abscess.—In many instances it is necessary to open into the pulp chamber of a tooth where the slightest touch of any kind inflicts severe suffering. This pain is due to the pressure upon the peri-dental membrane, which, owing to the inflammation, has become hypersensitive. In dealing with the six anterior teeth, the pain caused by the pressure of drilling is greatly reduced by the following technique: Having dried the labial aspects of the afflicted tooth and its near neighbors, make a small roll of Detroit Modeling Compound, about as big in diameter as a lead pencil and about three-quarters of an inch long. While warm, press it gently on to the labial surfaces of the sore tooth and its neighbors, and chill it with the cold air or cold water. Having made a tiny spear pointed drill, by grinding a number one-half round but flat on two opposite sides, the left hand supports the compound splint, while the enamel is easily and gently penetrated by the little drill which is used with the engine running at high speed. After opening through the en-

amel, the hole is easily increased in size by using larger burs with light pressure, and complete opening of the tooth has thus been accomplished with the minimum amount of pain. In the case of bicuspids and molars, it is possible to follow out a similar scheme, using two little splints of compound, one lingually and one labially, and holding them in place with the thumb and finger of the left hand. Where it is necessary to brace up a second molar, place ligatures in the interdental spaces, distally and mesially, and after the compound splints are in place, bring up the loose ends and tie them. This will give a very rigid support, while the tooth is being manipulated and will also permit the use of both hands while doing the work.—W. D. T.

Failures in porcelain inlays can justly be attributed to faulty cavity preparation, assuming the operator is correct in the instances where porcelain is indicated.

The walls of the cavity to receive a porcelain inlay should be as near square as is consistent to the removal of the matrix or impression. Slight curves at the base angles are correct, but never at the outer margins. Especially at the occlusal third of a proximate cavity in the anterior teeth should this principle be carried out. If the porcelain at this point is allowed to graduate into a thin layer failure is almost sure to result.

No restoration is more æsthetic and desirable in the anterior teeth, none more difficult of construction, and none more ignorantly used in general practice.—MARTIN C. TRACY.

BOOK REVIEWS

BY C. FRANKLIN MACDONALD, D.M.D.

THE SURGERY OF ORAL DISEASES AND MALFORMATIONS. THEIR DIAGNOSIS AND TREATMENT. By George V. I. Brown, D.D.S., M.D., Oral Surgeon to St. Mary's Hospital and to the Children's Free Hospital, Milwaukee; Professor of Oral Surgery, Southern Dental College, Atlanta, Ga. Octavo, 740 pages, with 359 engravings and 21 plates. Cloth, \$6.00. net. Lea & Febiger, Publishers, Philadelphia and New York, 1912.

Dr. G. V. I. Brown is known to the dental profession as an eminently successful oral surgeon, and many of his thoughts and experiences he has placed in print in the various dental journals. The doctor has now prepared a text-book embodying his conceptions of what the dentist should know, relative to the surgery and the diseases affecting the oral cavity.

Beginning with anæsthesia and its attendant dangers, the bulk of the subject matter is then divided into various general groups, as infectious diseases, diseases of the mucous membranes of the mouth, of the nervous system, of the bones and of the glands, with a chapter upon tumors. Under each of these groups the various pathological conditions which occur are taken up and discussed in more or less detail. Throughout the entire book and especially in the above subjects Dr. Brown evidently presupposes an extensive insight into general medicine. While the subjects are dealt with in a scientific manner and presented in a way most excellent for a medical man, it is to be feared that with the limited and special medical education which the average dentist now receives, it will be rather difficult for him to fully appreciate and comprehend them without continual recourse to works upon general medicine. The discussion of adenoids and enlarged tonsils considering how important they are, particularly to the orthodontist, seems very meager in detail; especially at this time when the relation between erupting teeth and enlarged tonsils is engaging the attention of the medical

men and bringing about more conservatism as to the removal of tonsils. Dr. Brown does not feel the necessity for any description whatsoever of these operations, yet the methods of carrying out these operations should prove just as interesting and profitable as the description for the removal of the Gasserian ganglion which is given. Under the treatments of the various diseases it is noticeable, with the exception of the subject of syphilis, that there is only a hint as to the drugs to be employed with no definite suggestions as to the methods of employing them or of possible combinations which the doctor has found beneficial in his own practise, or in the experience of others.

Following the study of the general diseases, the book takes up the more strictly oral diseases and malformations as those of the maxillary sinus—tongue, nose, and lips, and closes with a chapter upon harelip and cleft palate. The diseases of the maxillary sinus with the methods of treatment, are considered in detail which is most clear and instructive. The sealing of dressings into the antrum by collodion may be objected to by some. The treatment of contracted nares and deviated septa by direct separation of the maxillary bones in the median suture by means of a screw appliance is most interesting, and should be given serious thought and study not only by the rhinologist, but especially by the orthodontist.

In the treatment of harelip and cleft palate, the doctor is undoubtedly in his element, and he has given a most instructive and interesting discussion of these unfortunate conditions with details of methods for producing the best operative results, some of which are original with him.

The book is excellently printed and well illustrated with clear pictures and some very good colored plates.

In general, Dr. Brown is to be commended in his effort to give a scientific and strictly up to date book on oral diseases and surgery to the dental profession. In some cases it almost seems that he has credited to the dentist more general knowledge than he usually possesses, and has written without sufficient detail of explanation. For one who is well read in general medicine this book can be heartily recommended, and it may find its use as a *text-book* for students in correlation with teachers who will give the explanations and details which the book rather presupposes.

DENTAL JURISPRUDENCE: THE LAW RELATING TO DENTISTS AND THE PRACTICE OF DENTISTRY. By William E. Mikell, Professor of Law in the University of Pennsylvania. 12mo, 570 pages. Cloth, \$2.75, net. Lea & Febiger, Publishers, Philadelphia and New York, 1912.

The knowledge which dentists have of the laws relative to themselves and the laws as they are applied in the relations between themselves and their patients, is in practically all cases most meager and vague.

Professor Mikell has undertaken the study of the laws throughout the country of interest to dentists, and in this book has striven to enlighten them concerning these matters. Considering the fact that the laws are susceptible to many and different interpretations in the various courts of the States, the compilation of a treatise which would eliminate extensive repetitions and quotations and yet give the essential facts involved, is a work requiring much thought and study. Another great difficulty which the author was laboring under is the fact that he was writing for those who know nothing of the law and its peculiar phraseology. He was obliged to write in as simple and everyday English as would be possible. In this work he has been most successful.

The first third of the book is given over to the dentist and his relations to the laws in general. His standing before the courts is first considered, and the consensus of opinion seems to be that the dentist is embraced within the terms—"physicians and surgeons"—and should be treated as practising a special branch of medicine. This is followed by a consideration of the dentist's relations, liabilities, and contracts with patients; his liabilities for malpractice and his relations to the State, all of which are in general easily comprehended and most instructive.

The last two-thirds of the book is practically a reprint, in the original, of the laws and statutes which the various States and England, with her provinces, have enacted regarding the practise of dentistry. These are left for each to read and interpret for themselves. It may be questioned, whether in place of the actual laws a short summary of what each State requires

and what the general reading of there laws are, might not have been better, as the original laws are easily obtainable at any time.

Professor Mikell has given to the dental profession a most useful and instructive book along a line which has heretofore been accorded but scant recognition, and of which we should all have at least a passing knowledge, for ignorance of the law is never an excuse before the courts of justice.

A MANUAL OF CHEMISTRY. A Guide to Lectures and Laboratory Work for Beginners in Chemistry. A Text-book specially adapted for Students of Medicine, Pharmacy, and Dentistry. By W. Simon, Ph.D., M.D., Professor of Chemistry in the College of Physicians and Surgeons, Baltimore, and in the Baltimore College of Dental Surgery; Emeritus Professor in the Maryland College of Pharmacy; and Daniel Base, Ph.D., Professor of Chemistry in the University of Maryland. New (tenth) edition, enlarged and thoroughly revised. Octavo, 774 pages, with 82 engravings and 9 colored plates, illustrating 64 of the most important chemical tests. Cloth, \$3.00, net. Lea & Febiger, Philadelphia and New York.

The popularity of this Manual of Chemistry has demanded another edition, and the tenth has just been issued.

The ninth edition was reviewed briefly, but a comparatively short time ago in these pages, and after looking over this new edition the general excellence of the book is still to be noted. Additions, as have been necessary, have been made in the theoretical discussions especially relative to the modern thought upon ionic relations and ionization; also some of the more recent pharmaceutical compounds have been introduced. From the dental standpoint, the same criticisms are in order as for the last edition, and no additions or changes are to be noted of particular interest to the dentist.

As a reliable manual of the science of chemistry, general, organic, and physiological, this book is a good example. It should prove most valuable for general reading, and is particularly adapted for students in conjunction with lectures and laboratory work.

CURRENT NEWS

Items of professional news, of general interest, will be received by the Associate Editor at 51 West Forty-seventh Street, New York City.

The First District Dental Society of New York City has this winter planned a more extensive campaign than ever, as is evidenced by the number of sections it is fathering and the ability of the men who are giving their services as instructors.

The following sections are to be carried on under the general supervision of Dr. W. W. Walker:

Eclectic Orthodontia.

Crown and Bridge Work.

Porcelain and Gold Inlays.

Dental Pathology and Applied Therapeutics.

Dental Hygiene.

Oral Surgery.

Prosthetic Dentistry.

Stomatology and Dental Research.

Eclectic Orthodontia: Instruction by the following: Dr. Chas. R. Turner, University of Pennsylvania, and Drs. A. P. Voislowsky, V. H. Jackson, Robert Disbrow, and Oscar Carra-bine, New York City.

Crown and Bridge Work, Porcelain and Gold Inlays: Dr. H. F. Hamilton, Boston; Drs. Shields, Kanaga, and Hough, Philadelphia, and Drs. F. A. Peeso, L. M. Homburger, N. Shields, H. W. Gillett, and F. T. Van Woert, New York City.

Oral Surgery: Dr. M. H. Cryer, Dr. H. E. Tompkins, and Drs. Wm. Carr, Henry S. Dunning, C. B. Parker, M. I. Shamberg, H. S. Vaughn, and J. F. Hasbrouck, New York City.

Dental Pathology and Applied Therapeutics: Dr. T. B. Hartzell, Minneapolis; Dr. F. H. Skinner, Chicago; Dr. A. C. Fones, Bridgeport, Conn.; Dr. W. F. Dunlop, Spokane, Wash., and Drs. R. G. Hutchinson, Jr., and L. C. Le Roy, New York City.

Prosthetic Dentistry: Dr. J. Leon Williams, London, England, and Prof. Gysi, Zurich, Switzerland.

These sections really serve as post-graduate courses for the ordinary practitioner, and they show a distinct advance in the "hunt for knowledge," in which all thinking professional men of the present day are engaged.

* * *

At the National Dental Convention, Independent Journalism was not entirely forgotten, though nothing really definite was done in this regard. The Board of Trustees, however, has the power to appoint an editor and manager and generally to supervise the publication of the Journal of the National Dental Association. Too bad the dental politicians of this progressive country cannot combine forces, put aside their differences on this important point and absolutely establish the National Dental Journal, independent of trade houses, for which so many members of our profession are earnestly working. The American Medical Association has one, why shouldn't we?

A constitution and by-laws similar to that used by the American Medical Association was adopted upon the advice of the re-Organization Committee.

Another important change was decided upon as follows: Hereafter only members of State Dental Societies will be eligible for membership in the National Association. This rule, however, does not apply to territories or United States possessions or to members of the Army and Navy Dental Corps.

* * *

The great Panama Pacific World's Fair, to be held in San Francisco in 1915, will have its influence on dental affairs because of the International Dental Congress which is to be one of the attractions. Instead of a regular National Association meeting in 1915, the members of this body will gather in the Far West and will help to make this great convention an overwhelming success.

* * *

Dentistry is sometimes, if not always, recognized in its true worth. The friends of Dr. Isaac Burnett Davenport, of Paris, France, will be pleased to know that he has had conferred upon him, by the French Government, the title of "Chevalier of the

Legion of Honor" (Chevalier de la Legion d'honneur), as a reward for scientific attainment.

A few years ago Dr. Davenport was similarly honored by the Bavarian Government, because of valuable service performed by him in identifying the body of a member of the royal family, after fire had rendered identification, in any other way than by the teeth, hopeless.

* * *

Dr. Harold De Witt Cross, of the Harvard Dental School, has been secured as Director of the New Forsyth Infirmary of Boston, Mass. Dr. Cross, up to the present time, has been Assistant Professor of Prosthetic Dentistry at Harvard as well as a Member of the Administrative Board. He is eminently qualified to fill this new position, as he is a man of remarkable managerial ability with the happy faculty of coaxing all with whom he is associated to their best endeavors.

Skilled in his profession, a diplomat possessed of a strong desire to treat every one in a fair and square manner, Dr. Cross was probably the ablest and most popular instructor of recent years in the Harvard Dental School, and, accordingly, the Forsyth Infirmary is in the best possible hands.

CORRESPONDENCE

September 6, 1912.

To the Editor of THE JOURNAL:

I enclose two clippings from recent issues of the *Newport Daily News*—one an editorial with the title, "Corn-bread to Save the Teeth," the other a reply sent to the editor of the *News* by the members of the Newport Dental Society.

I send them with the thought that you may find them worthy of publishing as suggestions to other local dental societies. No doubt, the reply might be much improved upon. It is not sent as a model, but as a suggestion not to allow such derogatory statements and narrow views to be promulgated without protest.

Wherever small local societies exist there will frequently occur opportunities to take exception to some of the weak and misleading dental literature published in the daily papers. Well-

balanced replies from the local society will have the merit of being impersonal and of demonstrating the fact that dentists are alive to the welfare of the public and to the dignity of their own calling.

H. W. G.

CORN-BREAD TO SAVE THE TEETH

If you wish to be independent of the dentist eat corn-bread. That is the advice of one of the surgeons of the navy, who declares that the corn-bread eating habit is responsible for the fine teeth of all the men from the South who apply for enlistment. Whether or not, it is literally true that the common use of this article of diet will make one free from the decay and injury to which the teeth of the average person are subject, it would seem like good advice. It is recognized both within and without the profession that food which requires considerable mastication, and is of a somewhat coarse nature is helpful in keeping the teeth in good condition. They need frequent or constant polishing and hardening, which is done mechanically by rough food instead of by the application of a brush and powder or paste. Of course, it would not do to throw away the toothbrush just because one ate corn-bread as a steady diet, but the use of that article would be less necessary except for cleansing purposes.

One difficulty in following the advice of this authority on dental matters is that corn-bread is not a common article of diet in this part of the country, and it would hardly be possible for all who would like to have good teeth to travel South in search of it. Could not this doctor have gone a step further and advised the use of some other article of food which would accomplish the same purpose, or is corn-bread the only one which fills the bill? It would seem to the uninitiated as though there must be something else which would do nearly if not quite as well for those to whom corn-bread is an impossibility, since that can hardly be the only article of food rough enough in character and coarse enough in quality to have the same effect upon the teeth. Now, let some other physician tell us what else will answer the same purpose. The dentists probably know, but we can hardly blame them if they do not tell. They would thereby injure their business, and so we must turn to the regular physicians for help. Will some one speak up?

IN JUSTICE TO DENTISTS

Profession Constantly Advocating Avoidance of "Paps" and Use of Hard Foods

To the Editor of the Daily News:

SIR.—In the *Daily News* of September 3 there appeared an editorial with the title, "Corn-Bread to Save the Teeth." This editorial contains much good sense, and would require little correction to receive the approval of the dental profession had not its closing sentences presented misleading and unjust insinuations reflecting on dentists in general.

The dental profession is devoting much time and effort to the line of work your editorial suggests, its individual members are advocating constantly to their patients the avoidance of "paps," and the inculcation in children of food habits which shall result in a natural predilection for coarse and hard foods, which require thorough mastication for their full enjoyment.

It is estimated by competent authority that the universal adoption of this general principle, and rigid adherence to it, would result in eliminating at least 50 per cent. of the malocclusion and irregularity in the teeth and jaws of the next generation of children. If this be true, there would follow a great reduction in the amount of decay of the teeth themselves, because regularly placed and properly occluding teeth when effectively used on food material requiring complete trituration are to a large degree kept automatically clean by the excursions of the food over the teeth, and by reason of the normal approximate contact and gum relations which protect the surfaces most vulnerable to decay.

The growth and development of normal jaws and teeth call for a generous blood supply to the growing parts. The unused jaw, jaw muscles, and teeth of the pap-fed child fail to develop just as the muscular system fails to develop in the overpampered and underexercised subject. Moreover, the course above outlined would probably prevent in a great degree the development of that dread disease known commonly to the dentist as pyorrhea, and to the laity as "receding gums," or "Riggs disease," in the mouths of the generation which follows it intelligently and diligently.

Progressive dentists everywhere are constantly preaching such principles. They recognize that the possibilities of dental service to humanity are as yet very imperfectly realized—to use a common but expressive phrase, the profession has, as yet barely scratched the surface of its field, and to limit their usefulness by any such silly attitude as you impute to them is unthinkable. To suggest, as you have, that dentists are so blinded by a theory of self-interest seems to us gratuitously insulting, and we take vigorous exception to your editorial attitude.

Unanimously signed by the members of the Newport Dental Society.

NEWPORT, September 4, 1912.

NOTICE.

NEW JERSEY STATE DENTAL SOCIETY.

OFFICE OF SECRETARY, 47 CRESCENT AVENUE.

JERSEY CITY, N. J., November 19, 1912.

Editor THE JOURNAL:

DEAR SIR.—At the forty-second annual meeting of the New Jersey State Dental Society held at Cape May, N. J., July 17-19, 1912, the following officers were elected for the year 1912-1913:

William I. Thompson, D.D.S., President, Asbury Park; William H. Gelston, D.D.S., Vice-President, Camden; Charles F. Jones, D.D.S., Treasurer, Elizabeth; Edwin W. Harlan, D.D.S., Secretary, 47 Crescent Avenue, Jersey City; Wallace F. Naylor, D.D.S., Somerville, Assistant Secretary. Executive Committee: William Gelston, D.D.S., Chairman; Walter F. Barry, D.D.S., Orange; Henry Fowler, D.D.S., Harrison; James I. Woolverton, D.D.S., Trenton; C. P. Tuttle, D.D.S., Camden. Membership Committee: Joseph Kussy, D.D.S., Chairman, Newark; A. S. Burton, D.D.S., Asbury Park, Secretary; Franklin Rightmire, D.D.S., Paterson; J. F. Crandall, D.D.S., Atlantic City; Horace I. Beemer, D.D.S., Newton.

In addition to these Vernon D. Rood, D.D.S., Morristown, N. J., was elected for a term of five years as a member of the State Board of Examiners to succeed B. F. Luckey, D. D. S., Paterson.

Fraternally,

EDWIN W. HARLAN, *Secretary*.

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